Appendix E

Air Quality Modeling Results

E1. Air Quality Impact Analysis

Air Quality Impact Analysis

prepared for:

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March 15, 2002

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AIR QUALITY IMPACT ANALYSIS

This analysis estimates limited air quality impacts resulting from the proposed reoperation of the Patterson Sand and Gravel (PS&G) facility located northeast of Sheridan, California. The analysis used activity data provided by EDAW Inc., emission factors developed by EPA and CARB, and EPA-approved dispersion models to estimate downwind impacts of existing and proposed emissions from the facility and public haul routes. At EDAW's request, only two pollutants were modeled: PM_{10} (including Diesel exhaust particulate matter) and oxides of nitrogen (NOx). The modeling indicates that federal and California ambient air quality standards for PM_{10} may be exceeded by the worst-case impacts from the proposed project. The modeling also indicates that increased cancer risks to residents near the southern boundary of the facility may exceed one in 100,000 (1×10^{-5}) from Diesel exhaust particulate matter generated by mobile equipment operating in new mining areas.

Source Description

The PS&G facility generally consists of aggregate mining and production areas. Under the proposed reoperation plan, a new asphalt batch plant would be located near the aggregate production equipment, and future mining would occur in areas adjacent to the existing mining and production areas. Each of the future mining areas would be excavated sequentially such that no more than one area would be in operation at any one time. Six separate areas were analyzed as sources of emissions based on the description of the PS&G project contained in materials provided to Sierra by EDAW:

- The aggregate processing area, including the site of the proposed asphalt batch plant;
- The existing aggregate mining area, designated as the "Phase 1" or "baseline" excavation area;
- The two proposed aggregate mining areas, Phases 2 and 3, that will be in operation in 2005 and 2010, respectively; and
- Two sections of public haul routes serving the facility: portions of Camp Far West and Porter Roads near the facility; and portions of Riosa Road, E Street (Alternative 1), and a proposed new route (Alternative 2) through the town of Sheridan.

The emission sources operating within the areas modeled included both stationary and mobile equipment. Stationary equipment includes the aggregate processing system, a Diesel-powered water pump, and the future asphalt batch plant. Mobile equipment included excavation machines, off-highway haul trucks, service vehicles, employee vehicles, and on-highway haul trucks.

All of the stationary equipment, with the exception of the water pump, are located within the aggregate processing area. The aggregate processing system consists of crushers, screens, and conveyor belts that are used to crush, segregate, and stack aggregate in a variety of size ranges. A wash plant uses water-filled tanks to clean sand particles of silt and clay. The proposed asphalt batch plant will heat aggregate in a rotary drum equipped with a natural gas burner, mix the hot aggregate with liquid asphalt, and transfer the hot asphalt concrete to on-highway haul trucks. The water pump, which is located within the Phase 1 mining area, returns water from a settling pond to the aggregate processing area.

Within each mining area, mobile construction equipment will be used to excavate river bed deposits and transfer these materials to off-highway haul trucks for delivery to the aggregate processing system. Excavation will be performed by track-mounted, hydraulic boom excavators and track-mounted bulldozers. Rubber-tired scrapers will be used to remove and transfer overburden from areas of planned excavation to the spoils area for storage. Wheeled front-end loaders will load excavated materials into off-road haul trucks, which will transport these materials to the receiving hopper of the aggregate processing system. The haul distance from the mining area to the aggregate processing plant will vary, depending on the area being mined, from 1,800 to 7,000 feet. A heavy-heavy-duty on-highway Diesel truck will be used to apply water to the on-site haul roads for dust control, and a medium-heavy-duty Diesel truck will be used for daily lubrication and fueling of on-site mobile equipment.

Within the aggregate processing area, mobile equipment will be used to load and transport aggregate product and asphalt concrete from the premises. On-highway haul trucks transporting aggregate product will be loaded by rubber-tired front-end loaders. Trucks transporting asphalt concrete will be loaded directly from overhead bins.

Product from the facility will be transported over public roads through the town of Sheridan, several miles to the southwest of the facility. Between the facility and Sheridan, product haul trucks currently traverse Camp Far West Road, Porter Road, Karchner Road, and Riosa Road to access State Route 65. Two alternative haul routes through the town of Sheridan are also being considered for use in accessing Route 65. These routes include E Street (Alternative 1) and a proposed new route south of and parallel to E Street (Alternative 2).

Activity Data

The principal activity data used in the modeling analysis were data relating to hours of operation of the facility, miles traveled by onsite equipment, and traffic counts of on-highway haul trucks. All other activity data, such as aggregate and asphalt production rates, were incorporated into the worst-case emissions data provided by EDAW. For many of the sources, in the absence of more detailed assumptions, activity rates were assumed by Sierra to be constant at worst-case (maximum) levels for each hour of activity.

Most facility and on-highway hauling operations were assumed to occur during historical operating hours between 6:00 am and 5:00 pm. This schedule was used to represent the time periods when emissions for mining, aggregate processing, and on-highway truck hauling activities would occur. On the basis of information provided to EDAW by the applicant, operating hours for the Diesel-powered water pump were assumed to extend between 5:00 am and 5:00 pm daily. Because the applicant forecasted that the asphalt batch plant would operate up to 24 hours per day, operation was assumed to be continuous on a daily basis in the modeling analysis. Annual hours of operation were assumed to be 3,172 hours per year for the mining and aggregate processing activities, 3,850 hours per year for the water pump, and 857 hours per year for the asphalt batch plant, based on information provided to Sierra by EDAW.

Maximum on-highway truck traffic levels were provided to Sierra by EDAW on the basis of the traffic study conducted for the project. The values used by EDAW in computing worst-case emission rates for modeling purposes are presented in Table 1.

Table 1
Worst-Case On-Highway Truck Traffic Levels (One Way Trips to and from the Facility)

Averaging Period	Baseline Case	Future Case
Hour	128	105
Day	1,126	920
Year	134,000	107,500

Emissions Calculation

Emissions rates of existing stationary equipment and fugitive dust sources used in the modeling effort were derived primarily from engineering calculations performed by the Placer County Air Pollution Control District in permitting a change in stationary equipment in 1998. Emissions rates for the proposed asphalt batch plant were developed by EDAW from emissions factors published in EPA's emission factor compendium, AP-42[1*], and production rates proposed by the applicant. Exhaust emissions rates for on-highway and off-highway mobile equipment were calculated by Sierra Research from emissions factors produced by the California Air Resources Board (CARB) emission inventory program, EMFAC2001 Version 2.07[2], and the Sacramento Metropolitan Air Quality Management District's (SMAQMD) ROADMOD3[3] spreadsheet, respectively. EMFAC2001 was used to generate total emissions and total vehicle miles traveled (VMT) for the fleet of light-duty automobiles (LDA), light-duty trucks (LDT),

*Superscript numbers indicate references at the end of this report.

medium-heavy duty trucks (MHDT), and heavy-heavy duty trucks (HHDT) in Placer County. The estimates of total emissions within these vehicle classes in units of tons per day were divided by the daily VMT values estimated by the program to calculate the fleet-average emission factors for running emissions, expressed in grams per mile. The values reported by the program and used in this calculation are presented in Appendix A. In computing emissions from off-highway vehicles, the calculation methodology of ROADMOD3 was adjusted to include the specific power ratings of off-highway equipment operating at the facility, and corrected to incorporate more accurate vehicle turnover schedules. Exhaust emissions factors were computed for 2001 (baseline), 2005, and 2010 operating years.

A paved road PM_{10} emission factor for on-highway haul trucks was computed using the methodology published in AP-42, and a default silt-loading factor recommended by CARB.[4] The average truck weight was assumed to be 27.5 tons (the average of 15 tons empty and 40 tons loaded weight for on-highway haul trucks). The silt-loading factor used in emissions calculations was 0.32 grams per square meter of pavement. From these factors, the AP-42 equation computed an emission rate of 0.135 pounds (61.2 grams) of PM_{10} per vehicle-mile traveled.

Total on-highway truck emissions on public roads near the facility, together with subtotals of on-site emissions, are presented in Table 2.

Table 2
Facility Emissions Under Baseline and Proposed Operating Scenarios

	Diesel Exhaust PM	PM_{10}		NOx	
Source	max. lb/yr	max. lb/day	max. lb/yr	max. lb/hr	max. lb/yr
2001 (Baseline)					
Public Roads	225.1	218.7	26,025	7.7	8,059
Aggregate Processing Area	1,234	86.5	20,394	7.5	22,511
Diesel Water Pump	482.1	1.5	482.1	2.2	8,316
Phase 1 Mining Area	3,451	45.3	13,053	2.5	61,903
Total	5,392	352	59,954	19.9	100,789

Table 2 Facility Emissions Under Baseline and Proposed Operating Scenarios					
	Diesel Exhaust PM	PM_{10}		NOx	
Source	max. lb/yr	max. lb/day	max. lb/yr	max. lb/hr	max. lb/yr
2005 (Proposed)					
Public Roads	129.2	178.2	20,827	5.2	5,360
Aggregate Processing Area	878.9	85.2	20,039	6.0	17,968
Diesel Water Pump	482.1	1.5	482.1	2.2	8,316
Asphalt Batch Plant	0.0	51.7	2,460	10.5	9,000
Phase 2 Mining Area	2,466	63.0	18,151	15.7	49,719
Total	3,956	379.6	61,959	39.6	90,363
2010 (Proposed)					
Public Roads	108.2	178.1	20,807	4.1	4,149
Aggregate Processing Area	530	84.0	19,690	3.5	10,434
Diesel Water Pump	482.1	1.5	482.1	2.2	8,316
Asphalt Batch Plant	0.0	51.7	2,460	10.5	9,000
Phase 3 Mining Area	1,692	63.8	18,391	9.8	31,113
Total	2,812	379.1	61,830	30.1	63,012

Modeling Methodology

The EPA-approved Industrial Source Complex model, ISCST3 (Version 00101),[5] was used to model the air quality impacts of NOx, total PM_{10}, and Diesel exhaust PM_{10} emissions from the existing and proposed facility. This model can estimate the air quality impacts of single or multiple sources using actual meteorological conditions.

The model was configured with the following control parameters:

- Modeling switches: regulatory default
- Averaging periods: one-hour, 24-hour, and annual
- Choice of dispersion coefficients based upon land-use type: rural

The surface-level meteorological data used in the modeling analysis were collected at Beale Air Force Base between 1991 and 1995. The inversion height data for this period were collected at the Oakland Airport. The Beale Air Force Base monitoring site is located approximately 8.7 miles north of the project boundary and is the closest meteorological monitoring station. A wind rose illustrating prevailing wind speeds and directions for 1991 through 1995 is shown in Figure 1. (All figures are provided in Appendix B.)

All of the emissions sources at the facility and on the public roads were modeled as area sources with the exception of two stationary combustion sources. This choice of source configuration was based on the mobile character of mining activity, the number and distribution of stationary non-combustion sources within the aggregate processing area, and the mobile character of on-highway trucks traveling over public roads accessing the facility. The two stationary combustion sources that were modeled as point sources were the asphalt batch plant and the Diesel-powered water pump.

Separate model runs were conducted for each pollutant and averaging period. In each, the emission rates of applicable sources were configured to represent the worst-case conditions for that averaging period. For example, since the peak hourly on-highway truck traffic rate under the baseline scenario is 128 round trips per hour, this activity rate was used to compute an hourly, and equivalent gram-per-second, emission rate that was then assumed to occur each of the hours that the facility might be in operation (i.e., 6:00 am through 5:00 pm). This daily schedule was then replicated for each day of the year, and this emissions schedule was run with five years of meteorological data to find the peak hourly impact that might occur during the five-year period for comparison against the one-hour peak impact found using proposed project emissions. Comparable peak daily and annual activity rates were used to estimate worst-case daily and annual impacts, respectively, in other separate model runs. Near the facility, modeling runs were made to determine maximum 1-hour NO_2, annual NO_2, 24-hour PM_{10}, annual PM_{10}, and annual Diesel exhaust particulate impacts. Within the town of Sheridan, runs were made to determine only annual Diesel exhaust particulate impacts.

Because emissions rates for some sources will decline in the future, especially those of Diesel-powered equipment, air quality impacts were modeled for three operating years: 2001, 2005, and 2010. The 2001 scenario represents the existing processing equipment operating in conjunction with the Phase 1 mining area. (A diagram show the locations of the processing and mining areas within the project boundaries, together with the locations of the nearest residences, is presented in Figure 2.) The 2005 modeling scenario represents the processing equipment and the asphalt batch plant operating in conjunction with the Phase 2 mining area. The 2010 scenario is the same as that for 2005 except that the Phase 3 mining area will be in operation instead of the Phase 2 area.

Emissions from on-highway heavy-heavy-duty Diesel trucks hauling product from the facility were modeled to determine Diesel exhaust PM impacts and cancer risks at receptor sites near the facility and within the town of Sheridan. Near the facility, emissions from trucks traveling over those portions of Camp Far West Road, Porter Road, and Karchner Road within 1.5

miles of the facility entrance were modeled as a series of long, narrow area sources. Each affected road link was modeled as a long, narrow area with an aspect ratio not exceeding 10:1. The width of each link was set equal to the road width (24 feet, or 7.32 meters) plus 3 meters on each side to account for turbulent mixing, as recommended by guidance for modeling road links using such dispersion models as CALINE4[6], and the length of each modeled segment was set at no more than 10 times the segment width in conformance with input specifications of the ISCST model.

Within the town of Sheridan, model runs were conducted to determine Diesel exhaust PM impacts at residences near each of the current and two alternative haul routes. The locations of occupied residential structures adjacent or near to each of the three haul routes were identified from topographic maps and aerial photographs. The emissions from the on-highway haul trucks were given a release height of 15 feet (4.57 meters) to account for the height of the exhaust stack and initial plume rise of the heated exhaust. A schematic showing the modeled road links and nearby residential receptors is presented in Figure 3.

Receptor sites for which impacts were assessed included both residential locations and networks of evenly spaced points adjacent to the sources being evaluated. In the study of impacts near the facility, as recommended by EPA modeling guidance,[7] two networks of receptors consisting of concentric fine and coarse grids were created. The fine grid network consisted of receptors spaced every 25 meters apart on the Patterson Sand and Gravel property boundary and on two concentric rings 25 and 50 meters out from the property boundary. A second rectangular grid of receptors evenly spaced every 150 meters, surrounding the fine grid out to a distance of 1 kilometer from the facility property boundary, was also created. A diagram of the receptor grid surrounding the facility is displayed in Figure 4.

The receptor grid created to cover the town of Sheridan embodied the same concepts. A fine grid with receptor points evenly spaced every 25 meters overlays the town, and a coarse grid with points spaced every 150 meters out to a distance of 1 kilometer surrounds the fine grid. A diagram of the Sheridan receptor grid appears in Figure 5.

Air Quality Impacts

Air quality impacts were calculated by adding peak modeled impacts to the background ambient concentrations reported at the nearest permanent monitoring sites. These cumulative impacts were then compared to state and federal ambient air quality standards to determine whether cumulative impacts were significant. The peak concentrations estimated under current operating conditions were then compared to the corresponding peak concentrations attributable to the proposed project to determine whether the project would have an adverse impact on air quality.

Background nitrogen dioxide (NO_2) and PM_{10} concentrations were obtained from the annual Air Quality Summaries prepared by CARB. For NO_2, the monitoring site deemed most representative of background conditions found near Sheridan was the Yuba City station operated by CARB. Although a NO_2 monitor operated by the Placer County Air Pollution Control District (PCAPCD) in Roseville is slightly closer to the facility site, the Yuba City site monitors air quality in an area with an emission density more similar to that of the facility (i.e., rural area somewhat distant from a major metropolitan area) than is found near the Roseville monitoring site. Peak hourly and annual NO_2 concentrations measured over the most recent three years of published monitoring data were used to represent background conditions. For PM_{10}, the Lincoln site operated by the PCAPCD was deemed the most representative of background conditions at the facility. The Lincoln site is closest to the facility site and set in a similar rural area impacted by agricultural operations. Peak 24-hour and annual impacts from 1996 through 1997 at the Lincoln station—the most recent years for which complete data are available—were used to estimate peak background conditions.

The estimated one-hour ambient NO_2 concentration was evaluated using the ozone-limiting method. The ozone-limiting method is a standard EPA procedure to estimate short-term NO_2 concentrations.[8] The ozone-limiting method estimates the conversion of exhaust nitric oxide (NO) to NO_2 by reaction with ambient ozone (O_3). In general, NO_2 is less than 10 percent of the exhaust NOx from combustion sources, with the remaining amount consisting of nitric oxide (NO). The maximum amount of NO_2 in the atmosphere will consist of the exhaust NO_2 and the remaining NO that can be converted to NO_2 by reaction with O_3. If the ambient ozone concentration is less than 90 percent of the maximum modeled NOx concentration, complete consumption of ozone will result, and NO_2 formation will be limited. If the ambient ozone concentration is greater than 90 percent of the maximum calculated NOx ambient concentration, then it is assumed that all emitted NOx will contribute to ambient NO_2 levels.

PM_{10} Impacts

The peak PM_{10} impacts from the proposed facility operation were found to occur adjacent to the facility boundaries and near the public roads used to access the facility. The sources that dominated these impacts were paved- and unpaved-road dust generated by the on-highway and on-site haul trucks transporting product and mined material within and near the facility. Table 3 summarizes these maximum impacts, by operating year evaluated.

Plots of the maximum annual and 24-hour PM_{10} impacts adjacent to the facility for the operating years evaluated appear in Figures 6 through 11.

Table 3 Maximum Annual and 24-Hour PM_{10} Impacts		
Operating Year	Annual PM_{10} Impact $\mu g/m^3$	Max. 24-Hour PM_{10} Impact $\mu g/m^3$
2001 (Baseline)	14.5	171
2005 (Proposed)	13.2	139
2010 (Proposed)	13.0	139

The nearest permanent monitoring station to the facility is the Lincoln PM_{10} monitor operated by PCAPCD. The Lincoln station, which is closest to the facility, was operated only between the fourth quarter of 1995 and the end of 1997. The peak 24-hour and annual arithmetic mean concentrations recorded over full calendar years at this station are presented in Table 4.*

Table 4 Annual Average and Maximum 24-Hour PM_{10} Background Concentrations at Lincoln Monitoring Site		
Year	Annual Average $\mu g/m^3$	Max. 24-Hour $\mu g/m^3$
1996	18.5	60
1997	15.7	66
Maximum	18.5	66

The maximum PM_{10} impacts that would be experienced near the facility through operation of the baseline and proposed projects were computed by adding the worst-case modeled impacts from each of these operating scenarios to the highest background concentrations measured at nearby permanent monitoring stations. The maximum cumulative PM_{10} impacts resulting from these calculations are presented in Table 5.

As Table 5 indicates, the worst-case impacts from both the baseline and proposed projects added to the worst-case background concentrations are estimated to exceed the federal 24-hour ambient air quality standard and the California 24-hour and annual ambient air quality standards. The maximum PM_{10} impacts from the proposed project are lower than those of the baseline operation.

*Although the California annual PM_{10} standard is computed as a geometric mean of 24-hour measurements, the geometric mean is invariably smaller than the arithmetic mean of such measurements; thus, this analysis of arithmetic means will overestimate impacts when compared to the California annual standard.

Table 5 Maximum Cumulative PM_{10} Impacts From the Baseline and Proposed Projects					
Averaging Period	Worst-case Modeled Impacts, $\mu g/m^3$	Highest Background Concentration $\mu g/m^3$	Maximum PM_{10} Impacts, $\mu g/m^3$	Ambient Air Quality Standards	
				State $\mu g/m^3$	Federal $\mu g/m^3$
2001 (Baseline)					
24-Hour	171	66	237	50	150
Annual	14.5	18.5	33	30	50
2005 (Proposed)					
24-Hour	139	66	205	50	150
Annual	13.2	18.5	31.7	30	50
2010 (Proposed)					
24-Hour	139	66	205	50	150
Annual	13.0	18.5	31.5	30	50

NO_2 Impacts

NOx impacts from on-site sources and related on-highway travel near the facility are also estimated by the model to peak near the mining areas and aggregate processing areas within the facility. Elevated 1-hour NOx concentrations are estimated to occur both north and south of the facility, with the peak values estimated to occur along the facility boundaries near the active mining areas. The ten highest 1-hour NOx readings under each operating scenario were converted to equivalent NO_2 values by applying the ozone-limiting method using the ozone concentration measured at the Yuba City monitoring station on the same hour and date. This conversion was also applied to the maximum NOx concentrations estimated by the model on each hour and date that the ten highest 1-hour ozone concentrations were recorded between 1991 and 1995 at the Yuba City station. Annual NO_2 impacts resulting from facility operation were computed by multiplying the maximum annual NOx impacts estimated by the ISCST3 model by 0.75, the annual NO_2/NOx default ratio recommended by EPA.[9] A list of maximum annual and hourly NO_2 facility impacts in each of the operating years evaluated appears in Table 6.

Table 6 Maximum Annual and 1-Hour NO_2 Impacts Near the Facility		
Operating Year	Annual Average $\mu g/m^3$	Max. 1-Hour $\mu g/m^3$
2001 (Baseline)	12.2	129
2005 (Proposed)	15.6	160
2010 (Proposed)	8.4	68

Plots of the maximum annual NO_2 impacts adjacent to the facility for each of the operating years evaluated appear in Figures 12 through 14.

The permanent NO_2 monitoring station sampling air quality most representative of background conditions found at the facility is the Yuba City site operated by CARB. The peak 1-hour and annual average concentrations recorded over the most recent five-year period of operation are presented in Table 7.

Table 7 Annual Average and Maximum 1-Hour NO_2 Background Concentrations at Yuba City Monitoring Site		
Year	Annual Average $\mu g/m^3$	Maximum 1-Hour $\mu g/m^3$
1996	22.6	128
1997	26.3	137
1998	24.4	139
1999	26.3	160
2000	24.4	135
Maximum	26.3	160

The maximum NO_2 impacts that would be experienced near the facility through operation of the baseline and proposed projects were computed by adding the worst-case modeled impacts in each of the operating years evaluated to the highest background concentrations measured at the closest permanent monitoring station. The maximum cumulative NO_2 impacts resulting from this calculation are presented in Table 8.

Table 8 Maximum Cumulative NO_2 Impacts From the Baseline and Proposed Projects					
Averaging Period	Worst-case Modeled Impacts, $\mu g/m^3$	Highest Background Concentration $\mu g/m^3$	Maximum NO_2 Impacts, $\mu g/m^3$	Ambient Air Quality Standards	
				State $\mu g/m^3$	Federal $\mu g/m^3$
2001 (Baseline)					
1-Hour	129	160	289	470	
Annual	12.2	26.3	38.5		100
2005(Proposed)					
1-Hour	160	160	320	470	
Annual	15.6	26.3	41.9		100
2010 (Proposed)					
1-Hour	68	160	228	470	
Annual	8.4	26.3	34.7		100

As Table 8 indicates, the worst-case impacts from the baseline and proposed operations added to the worst-case background concentrations are not estimated to exceed either the California 1-hour or federal annual ambient air quality standard for NO_2.

Diesel Exhaust Particulate Matter Impacts

Diesel exhaust PM impacts from on-site sources and related on-highway travel near the facility were estimated to peak along the facility boundaries near the aggregate processing and active mining areas. This result is due to the substantial emissions produced by mining and on-site transport equipment operating within the facility premises. The highest receptor impacts occur at occupied residences that are nearest to the boundaries of active areas within the facility. Within the town of Sheridan, peak Diesel exhaust PM impacts were estimated by the ISCST3 model to occur near the public roads used by product haul trucks. Table 9 lists the annual average Diesel exhaust PM concentrations occurring at the residential and workplace receptors experiencing the highest impacts near the facility and within Sheridan in each of the operating years evaluated. No impacts are listed for workplace receptors near the facility as no workplaces are located near the facility boundaries.

Table 9 Average Annual Diesel Exhaust PM Impacts at the Maximally Exposed Residential and Workplace Receptors Near the Facility and Within the Town of Sheridan		
	Annual Diesel Exhaust PM Impact, $\mu g/m^3$	
Scenario	Residential Receptor	Workplace Receptor
Near Facility		
2001 (Baseline)	0.285	NA
2005 (Proposed)	0.173	NA
2010 (Proposed)	0.118	NA
Sheridan		
2001 (Baseline)	0.0466	0.00867
2005 (Alternate Route #1)	0.0271	0.0102
2005 (Alternate Route #2)	00301	0.00350
2010 (Alternate Route #1)	0.0226	0.00852
2010 (Alternate Route #2)	0.0251	0.00292

Diesel Exhaust PM Health Risks

The Unit Risk Value for Diesel exhaust particulates recommended by the California Office of Environmental Health Hazard Assessment is 3.0×10^{-4} per microgram per cubic meter ($\mu g/m^3$).[10] This means that for receptors exposed to an annual average concentration of 1 $\mu g/m^3$ in the ambient air, the probability of contracting cancer over a 70-year lifetime of exposure is 300 in one million. This Unit Risk Value considers exposure via inhalation only. The potential exposure through other pathways (e.g., ingestion) requires substance- and site-specific data, and the specific parameters for Diesel exhaust are not known for these pathways.[11]

The maximum modeled annual average concentrations for exposures at the maximally exposed residential receptors, the Unit Risk Value, and the corresponding cancer risk resulting from the modeled exposure levels under each of the four facility operating scenarios are presented in Table 10. Because there are no off-site workplaces or sensitive receptors near the facility, only residential exposures were evaluated.

Table 10 Summary of Diesel Exhaust PM Cancer Risks Near the Facility			
Operating Scenario	Maximum Modeled Annual Impact $\mu g/m^3$	Unit Risk Value $(\mu g/m^3)^{-1}$	Cancer Risk
2001 (Baseline)	0.285	3.0×10^{-4}	86×10^{-6}
2005 (Proposed)	0.173	3.0×10^{-4}	52×10^{-6}
2010 (Proposed)	0.118	3.0×10^{-4}	35×10^{-6}

Estimated Diesel exhaust PM cancer risks are projected to decline in future operating years as cleaner vehicles replace existing ones. Over all operating years, estimated cancer risks exceed 10×10^{-6}, the level deemed significant under Proposition 65 and AB 2588 (Toxic "Hot Spots" Act). Plots of the areas in which cancer risks exceed this significance level for each operating year evaluated are presented in Figures 15 through 17.

Table 11 presents the maximum modeled annual concentrations within the town of Sheridan for exposures at the maximally exposed residential, workplace, and sensitive receptors; the Unit Risk Value; a time adjustment factor; and the corresponding cancer risks resulting from the modeled exposure levels for each of the three haul routes. The time adjustment factor for residential exposures assumes, as a worst case, that residents are exposed continuously for 8,760 hours per year and 70 years. The time adjustment factor for workplace exposures assumes, as a worst case, that off-site workers are exposed to concentrations for every hour that the facility operates and for 46 years during their employment career. The factor for sensitive receptor exposures assumes that sensitive individuals are located at the maximally exposed residence for a 70-year lifetime. Sensitive receptors include facilities that house or attract children, the elderly, or people with illnesses or others who are especially sensitive to the effect of air pollutants.

As shown in Table 11, the estimated cancer risks are highest at residential and sensitive receptor sites during the baseline year. These risks are lower for the alternative haul routes in future years as a result of a decrease in the number of truck trips and cleaner trucks projected for use in future years.

Receptor Type	Maximum Modeled Annual Average Impact $\mu g/m^3$	Unit Risk Value $(\mu g/m^3)^{-1}$	Time Adjustment Factor	Cancer Risk
Table 11 **Summary of Diesel Exhaust PM Cancer Risks Within Sheridan**				
Riosa Road - 2001 (Baseline)				
Residential	0.0466	3.0×10^{-4}	1.0	14×10^{-6}
Workplace	0.0087	3.0×10^{-4}	0.66	1.7×10^{-6}
Sensitive	0.0466	3.0×10^{-4}	1.0	14×10^{-6}
Alternative Route 1 - 2005 (Proposed)				
Residential	0.0271	3.0×10^{-4}	1.0	8.1×10^{-6}
Workplace	0.0102	3.0×10^{-4}	0.66	2.6×10^{-6}
Sensitive	0.0271	3.0×10^{-4}	1.0	8.1×10^{-6}
Alternative Route 2 - 2005 (Proposed)				
Residential	0.0301	3.0×10^{-4}	1.0	9.0×10^{-6}
Workplace	0.0035	3.0×10^{-4}	0.66	0.69×10^{-6}
Sensitive	0.0301	3.0×10^{-4}	1.0	9.0×10^{-6}
Alternative Route 1 - 2010 (Proposed)				
Residential	0.0226	3.0×10^{-4}	1.0	6.8×10^{-6}
Workplace	0.0085	3.0×10^{-4}	0.66	1.7×10^{-6}
Sensitive	0.0226	3.0×10^{-4}	1.0	6.8×10^{-6}
Alternative Route 2 - 2010 (Proposed)				
Residential	0.0251	3.0×10^{-4}	1.0	7.5×10^{-6}
Workplace	0.0029	3.0×10^{-4}	0.66	0.57×10^{-6}
Sensitive	0.0251	3.0×10^{-4}	1.0	7.5×10^{-6}

The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) has recommended an ambient concentration of 5 micrograms per cubic meter (μg/m3) as the chronic inhalation Reference Exposure Level (REL) for Diesel exhaust.

The REL is the concentration at or below which no adverse health effects are anticipated.* No inhalation REL for acute (i.e., short-term) effects has been determined by OEHHA.

Table 12 shows the maximum modeled annual concentrations for exposures at the maximally exposed residential, workplace, and sensitive receptors; the Reference Exposure Level for chronic noncancer impacts; and the corresponding hazard index resulting from the modeled exposure levels at these locations.

As shown in Table 12, the estimated chronic hazard indices at the maximally exposed receptors are less than the chronic inhalation Reference Exposure Level (REL) for Diesel exhaust PM.

Table 12
Summary of Modeled Chronic Hazard Indices Within Sheridan

Receptor Type	Maximum Modeled Annual Impact $\mu g/m^3$	Chronic Reference Exposure Level $\mu g/m^3$	Chronic Hazard Index
Riosa Road - 2001 (Baseline)			
Residential	0.0466	5	0.0093
Workplace	0.0087	5	0.0017
Sensitive	0.0466	5	0.0093
Alternative Route 1 - 2005 (Proposed)			
Residential	0.0271	5	0.0054
Workplace	0.0102	5	0.0020
Sensitive	0.0271	5	0.0054
Alternative Route 2 - 2005 (Proposed)			
Residential	0.0301	5	0.0060
Workplace	0.0035	5	0.0007
Sensitive	0.0301	5	0.0060

* In accordance with the California Air Pollution Control Officers Association health risk assessment guidelines, "[t]he potential for chronic health effects should be evaluated by comparing the long-term exposure levels (the average daily intake for the noninhalation route of exposure, and the estimated annual average concentration for the inhalation route) to the RELs . . ."

Table 12 Summary of Modeled Chronic Hazard Indices Within Sheridan			
Receptor Type	Maximum Modeled Annual Impact $\mu g/m^3$	Chronic Reference Exposure Level $\mu g/m^3$	Chronic Hazard Index
Alternative Route 1 - 2010 (Proposed)			
Residential	0.0226	5	0.0045
Workplace	0.0085	5	0.0017
Sensitive	0.0226	5	0.0045
Alternative Route 2 - 2010 (Proposed)			
Residential	0.0251	5	0.0050
Workplace	0.0029	5	0.0006
Sensitive	0.0251	5	0.0050

Conclusions

This analysis indicates that the current and proposed operations of the Patterson Sand & Gravel facility may cause violations of the federal 24-hour ambient air quality standard for PM_{10}, and the California 24-hour and annual ambient air quality standards for PM_{10}. Concentrations of Diesel particulate matter near the facility, and within the town of Sheridan in the baseline case, as estimated by the modeling, would result in incremental cancer risk levels greater than ten in a million (10×10^{-6}).

References

1. Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, U.S. Environmental Protection Agency, January 1995.

2. EMFAC2001 Version 2.04, California Air Resources Board, November 2001, http://www.arb.ca.gov/regact/zev2001/zev2001.htm

3. Roadway Construction Emissions Model, Version 2.1, Sacramento Metropolitan Air Quality Management District, 2001.

4. Area Source Methodologies, Paved Entrained Road Dust, California Air Resources Board, July 1997, http://www.arb.ca.gov/emisinv/areasrc/fullpdf/full7-9.pdf

5. "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models," U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, September 1995.

6. CALINE4 - A Dispersion Model for Predicting Air Pollutant Concentrations Near Roadways, Report No. FHWA/CA/TL-84/15, California Department of Transportation, November 1984.

7. Title 40, Code of Federal Regulations, Part 51, Appendix W, Guideline of Air Quality Models

8. Cole, H.S., and J.E. Summerhays 1978: A Review of Techniques Available for Estimating Short-Term NO2 Concentrations, *J. Air Pollut. Control Assoc.*, 29, 812-817.

9. 40 CFR Part 51, Appendix W, Code of Federal Regulations, July 2001.

10. "Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant," California Air Resources Board and Office of Environmental Health Hazard Assessment, June 1998.

11. Report to the Air Resources Board on the Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Part A Exposure Assessment," Approved by the Scientific Review Panel, April 1998.

Appendix A

EMFAC2001 Output

On-Road Motor Vehicle Emissions EMFAC2001 v 2.04 Sacramento Valley portion of Placer County						
Parameter	**Units**	**VOC**	**CO**	**NOx**	**SOx**	**PM10**
Light-Duty Automobiles (LDA)						
2001 Calendar Year						
Daily Emissions	tons/day	4.14	35.20	3.18	0.02	0.04
Daily Vehicle Miles Traveled	miles/day	3,050,000	3,050,000	3,050,000	3,050,000	3,050,000
Emission Factor	gm/mile	1.23	10.47	0.95	0.005	0.012
2005 Calendar Year						
Daily Emissions	tons/day	2.80	24.25	2.06	0.02	0.05
Daily Vehicle Miles Traveled	miles/day	3,462,000	3,462,000	3,462,000	3,462,000	3,462,000
Emission Factor	gm/mile	0.73	6.35	0.54	0.005	0.012
2010 Calendar Year						
Daily Emissions	tons/day	1.85	16.45	1.31	0.02	0.05
Daily Vehicle Miles Traveled	miles/day	4,028,000	4,028,000	4,028,000	4,028,000	4,028,000
Emission Factor	gm/mile	0.42	3.70	0.30	0.005	0.012
Light-Duty Trucks (LDT)						
2001 Calendar Year						
Daily Emissions	tons/day	2.45	25.70	2.86	0.01	0.04
Daily Vehicle Miles Traveled	miles/day	1,730,000	1,730,000	1,730,000	1,730,000	1,730,000
Emission Factor	gm/mile	1.28	13.48	1.50	0.005	0.020
2005 Calendar Year						
Daily Emissions	tons/day	2.01	19.07	1.97	0.01	0.04
Daily Vehicle Miles Traveled	miles/day	1,892,000	1,892,000	1,892,000	1,892,000	1,892,000
Emission Factor	gm/mile	0.96	9.14	0.94	0.005	0.020
2010 Calendar Year						
Daily Emissions	tons/day	1.61	13.82	1.36	0.01	0.05
Daily Vehicle Miles Traveled	miles/day	2,179,000	2,179,000	2,179,000	2,179,000	2,179,000
Emission Factor	gm/mile	0.67	5.75	0.57	0.005	0.020
Medium-Heavy-Duty Trucks (MHDT)						
2001 Calendar Year						
Daily Emissions	tons/day	0.37	5.25	1.47	0.01	0.02
Daily Vehicle Miles Traveled	miles/day	111,000	111,000	111,000	111,000	111,000
Emission Factor	gm/mile	3.02	42.91	12.01	0.082	0.165

On-Road Motor Vehicle Emissions EMFAC2001 v 2.04 Sacramento Valley portion of Placer County						
Parameter	**Units**	**VOC**	**CO**	**NOx**	**SOx**	**PM10**
2005 Calendar Year						
Daily Emissions	tons/day	0.27	3.55	1.21	0.01	0.02
Daily Vehicle Miles Traveled	miles/day	111,000	111,000	111,000	111,000	111,000
Emission Factor	gm/mile	2.21	29.01	9.89	0.082	0.165
2010 Calendar Year						
Daily Emissions	tons/day	0.19	2.51	0.93	0.01	0.02
Daily Vehicle Miles Traveled	miles/day	108,000	108,000	108,000	108,000	108,000
Emission Factor	gm/mile	1.60	21.08	7.81	0.082	0.165
Heavy-Heavy-Duty Trucks (HHDT)						
2001 Calendar Year						
Daily Emissions	tons/day	0.12	0.51	2.15	0.02	0.06
Daily Vehicle Miles Traveled	miles/day	102,000	102,000	102,000	102,000	102,000
Emission Factor	gm/mile	1.07	4.54	19.12	0.181	0.534
2005 Calendar Year						
Daily Emissions	tons/day	0.09	0.38	1.66	0.02	0.04
Daily Vehicle Miles Traveled	miles/day	95,000	95,000	95,000	95,000	95,000
Emission Factor	gm/mile	0.86	3.63	15.85	0.181	0.382
2010 Calendar Year						
Daily Emissions	tons/day	0.07	0.27	1.15	0.02	0.03
Daily Vehicle Miles Traveled	miles/day	85,000	85,000	85,000	85,000	85,000
Emission Factor	gm/mile	0.75	2.88	12.27	0.181	0.320

Appendix B

Figures

Figure 1

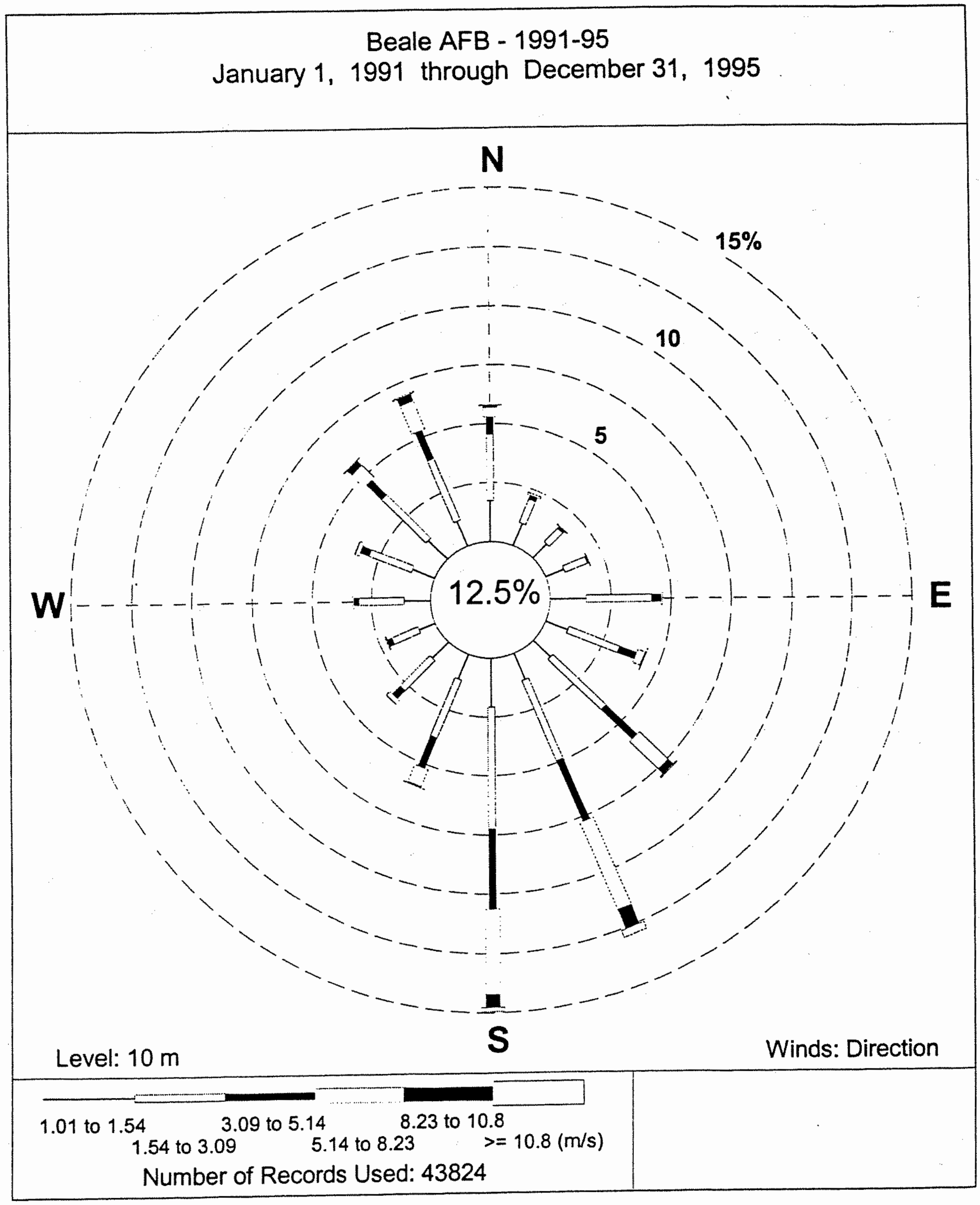

Beale AFB - 1991-95
January 1, 1991 through December 31, 1995
N
15%
10
5
12.5%
W
E
S
Level: 10 m
Winds: Direction
1.01 to 1.54
1.54 to 3.09
3.09 to 5.14
5.14 to 8.23
8.23 to 10.8
>= 10.8 (m/s)
Number of Records Used: 43824

Figure 2

Patterson Sand & Gravel
Mining Areas, Road Links, and Residential Locations

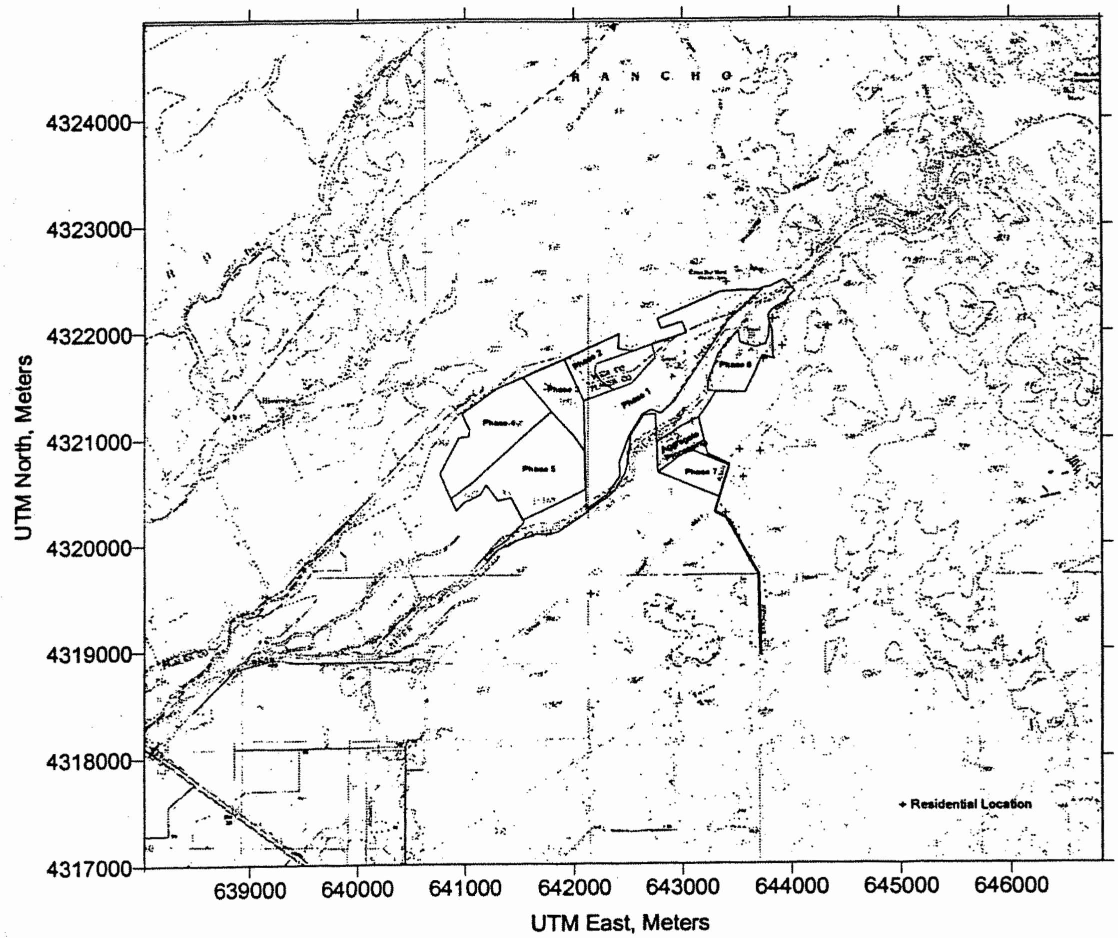


Figure 3

Patterson Sand & Gravel
Sheridan Road Links and Residential Locations

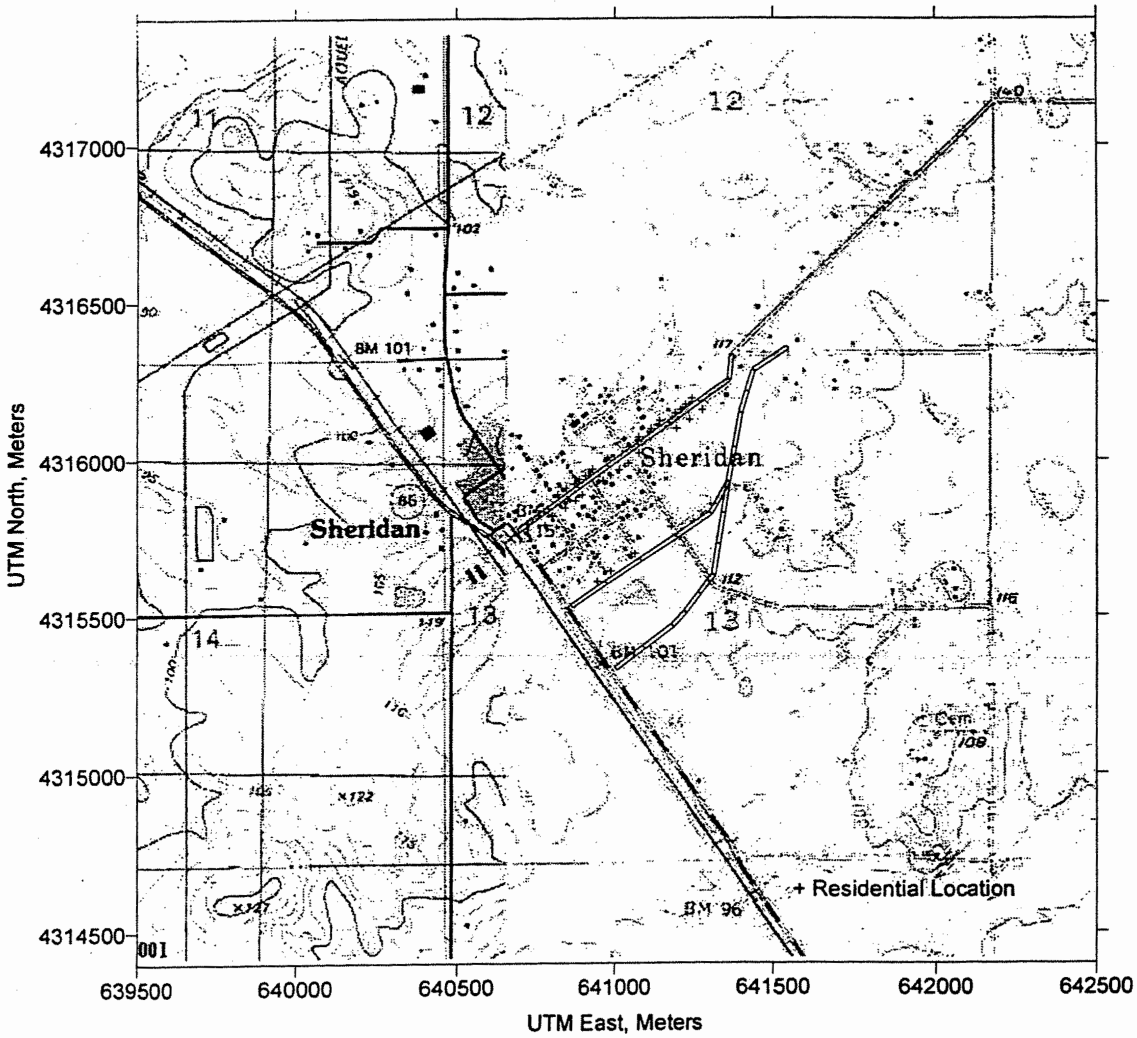


Figure 4

Patterson Sand & Gravel
Facility Modeling Receptor Grid

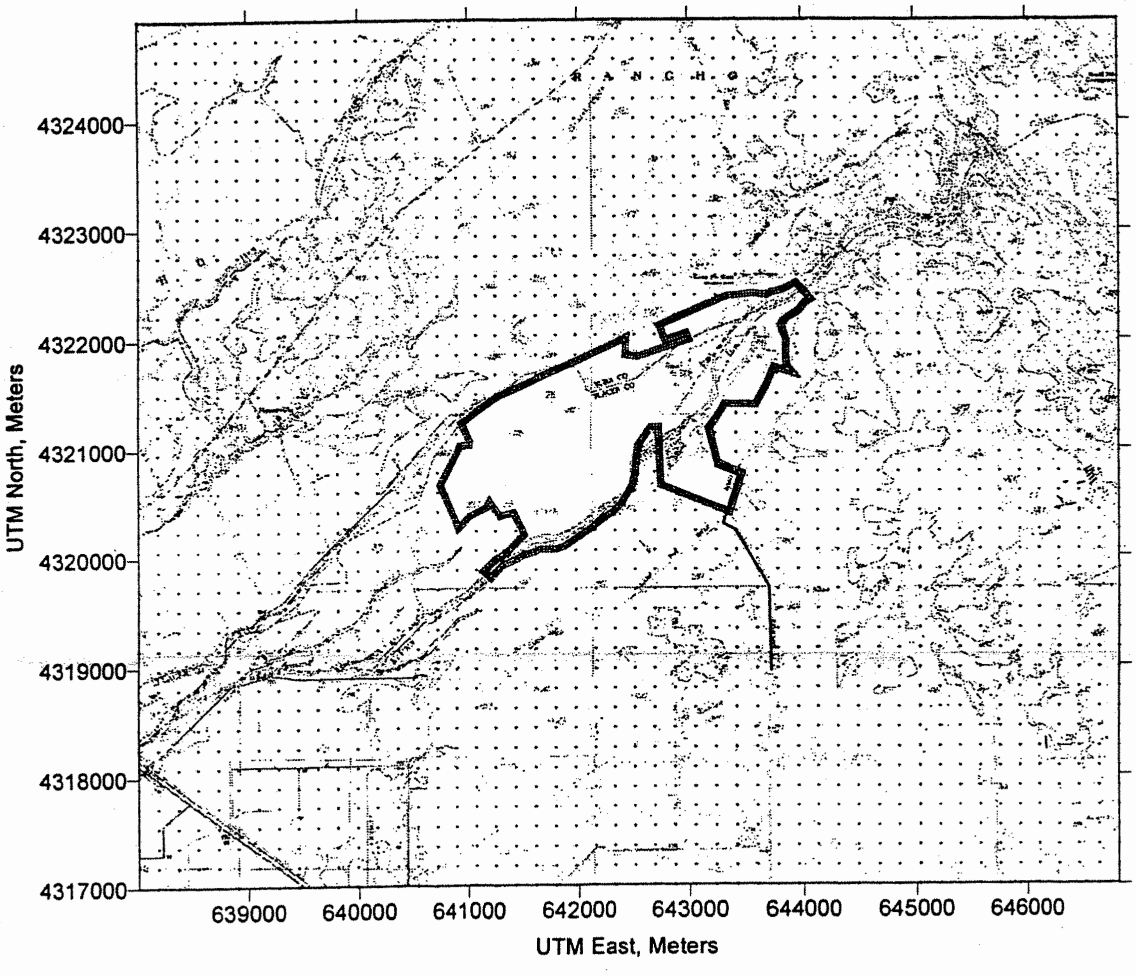


Figure 5

Patterson Sand & Gravel
Sheridan Modeling Receptor Grid

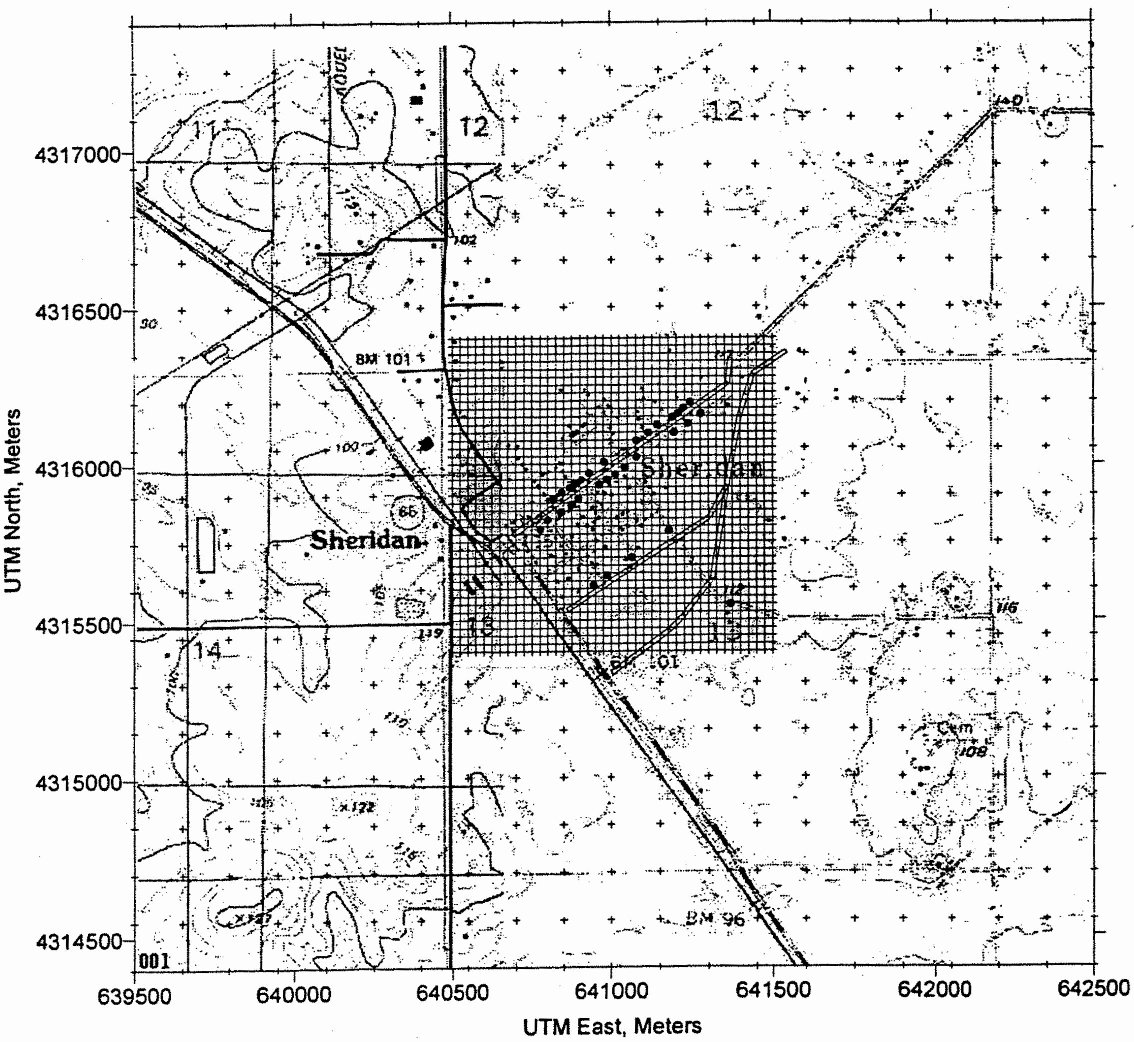


Figure 6

Patterson Sand & Gravel
Maximum Annual PM10 - 2001
ug/m3

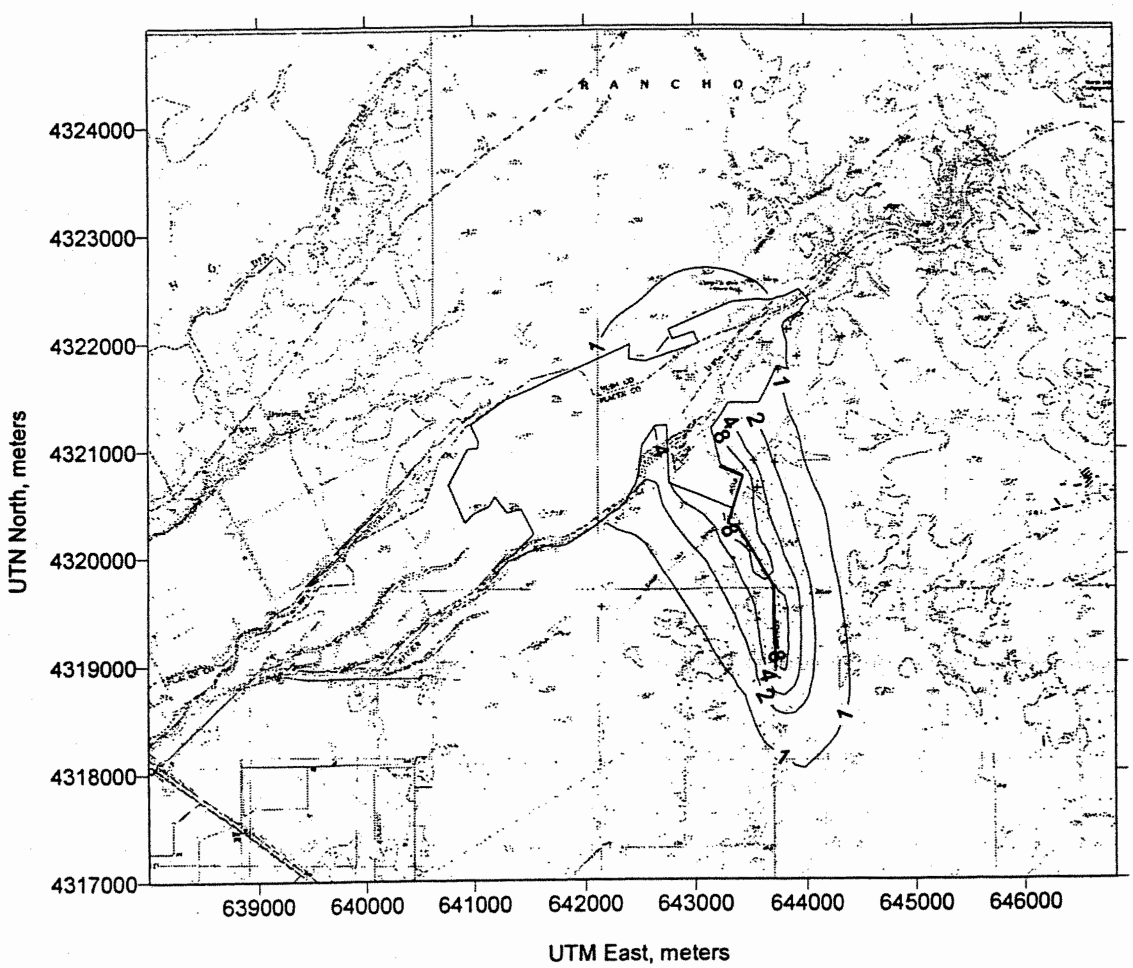


Figure 7

Patterson Sand & Gravel
Maximum Annual PM10 - 2005
ug/m3

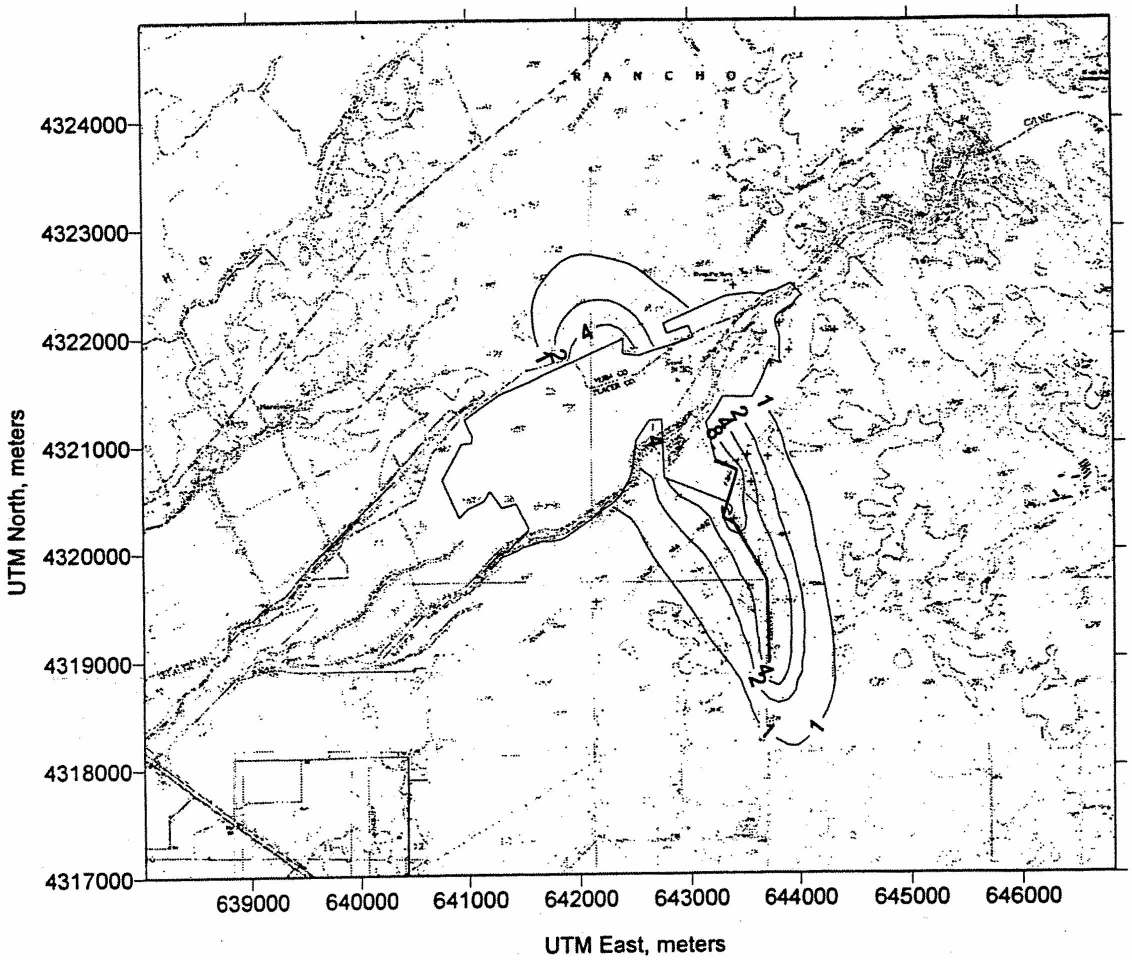


Figure 8

.Patterson Sand & Gravel
Maximum Annual PM10 - 2010
ug/m3

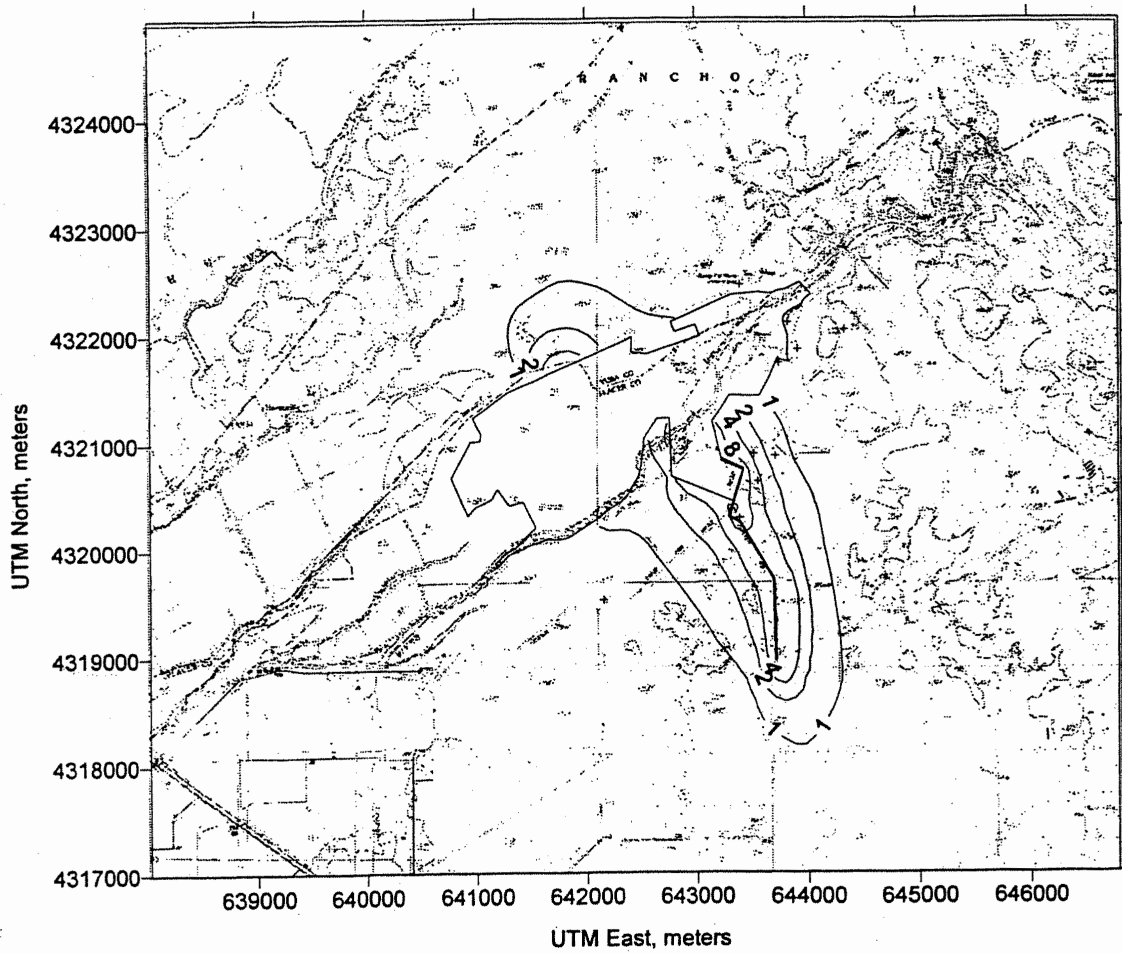


Figure 9

Patterson Sand & Gravel
Maximum 24-Hour PM10 - 2001
ug/m3

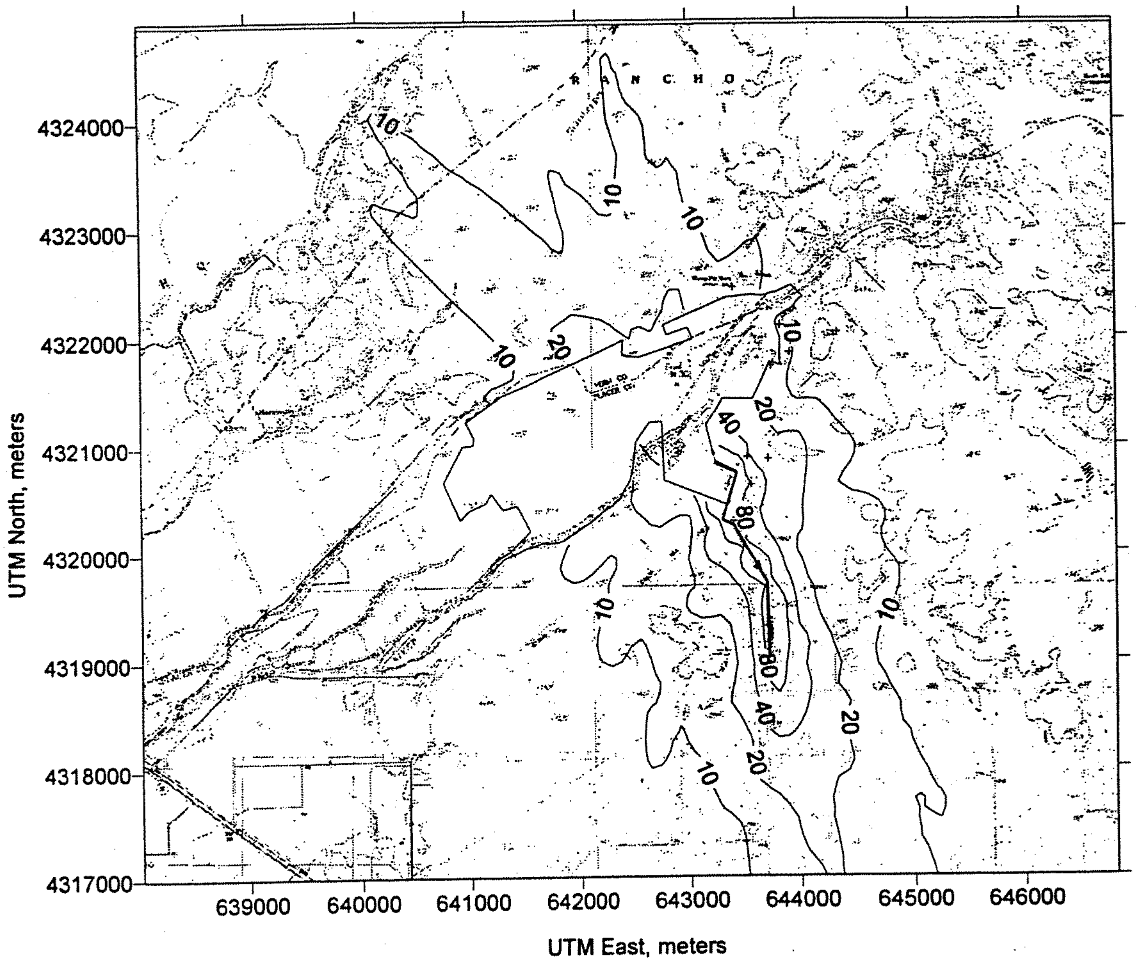


Figure 10

Patterson Sand & Gravel
Maximum 24-Hour PM10 - 2005
ug/m3

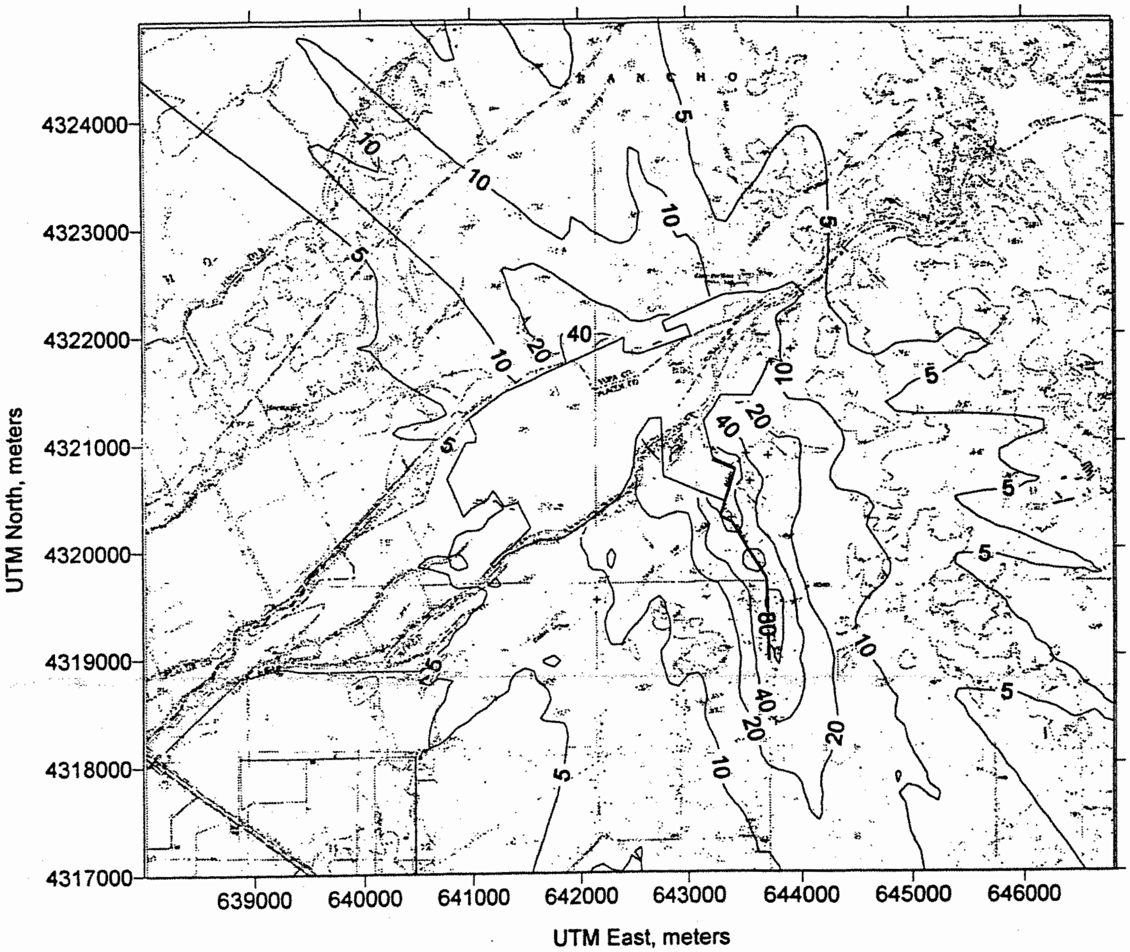


Figure 11

Patterson Sand & Gravel
Maximum 24-Hour PM10 - 2010
ug/m3

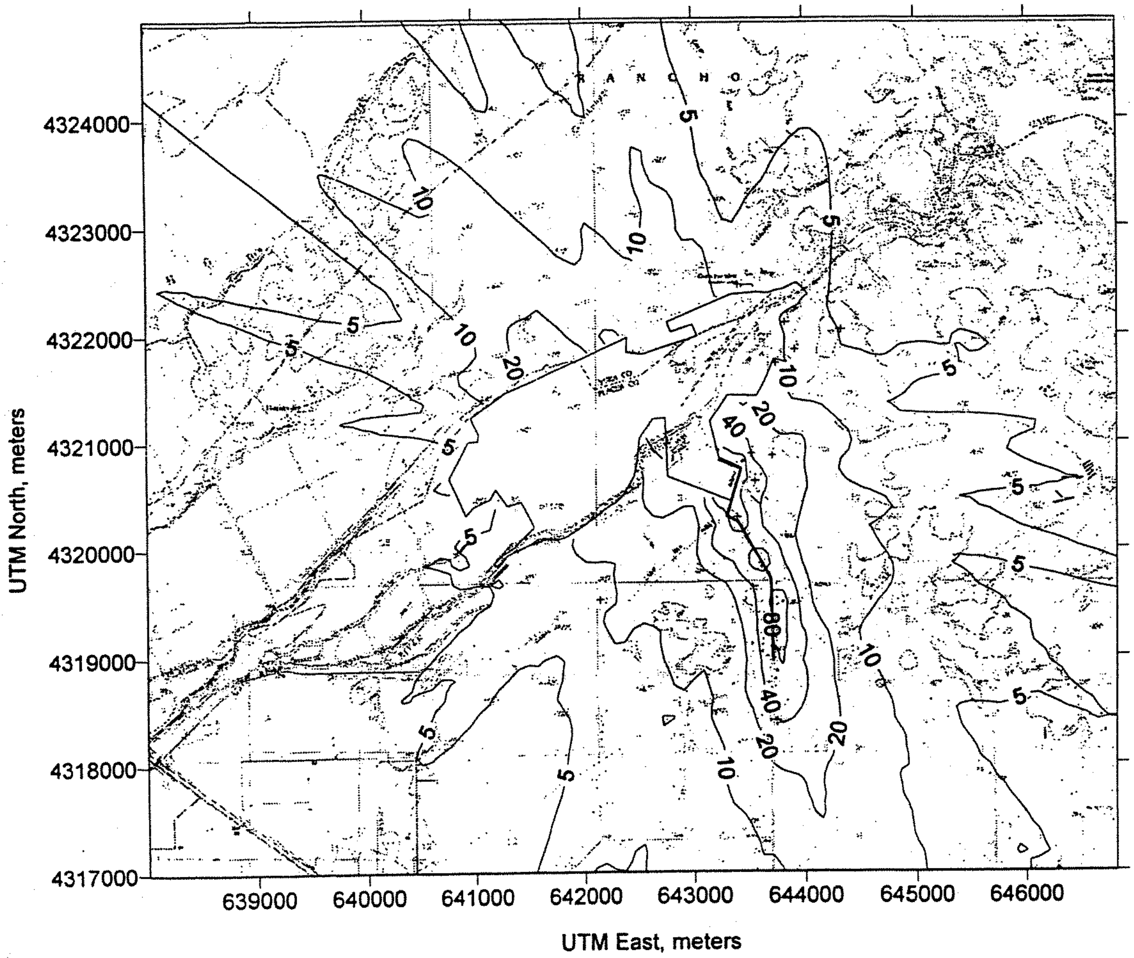


Figure 12

Patterson Sand & Gravel
Maximum Annual NO2 - 2001
ug/m3

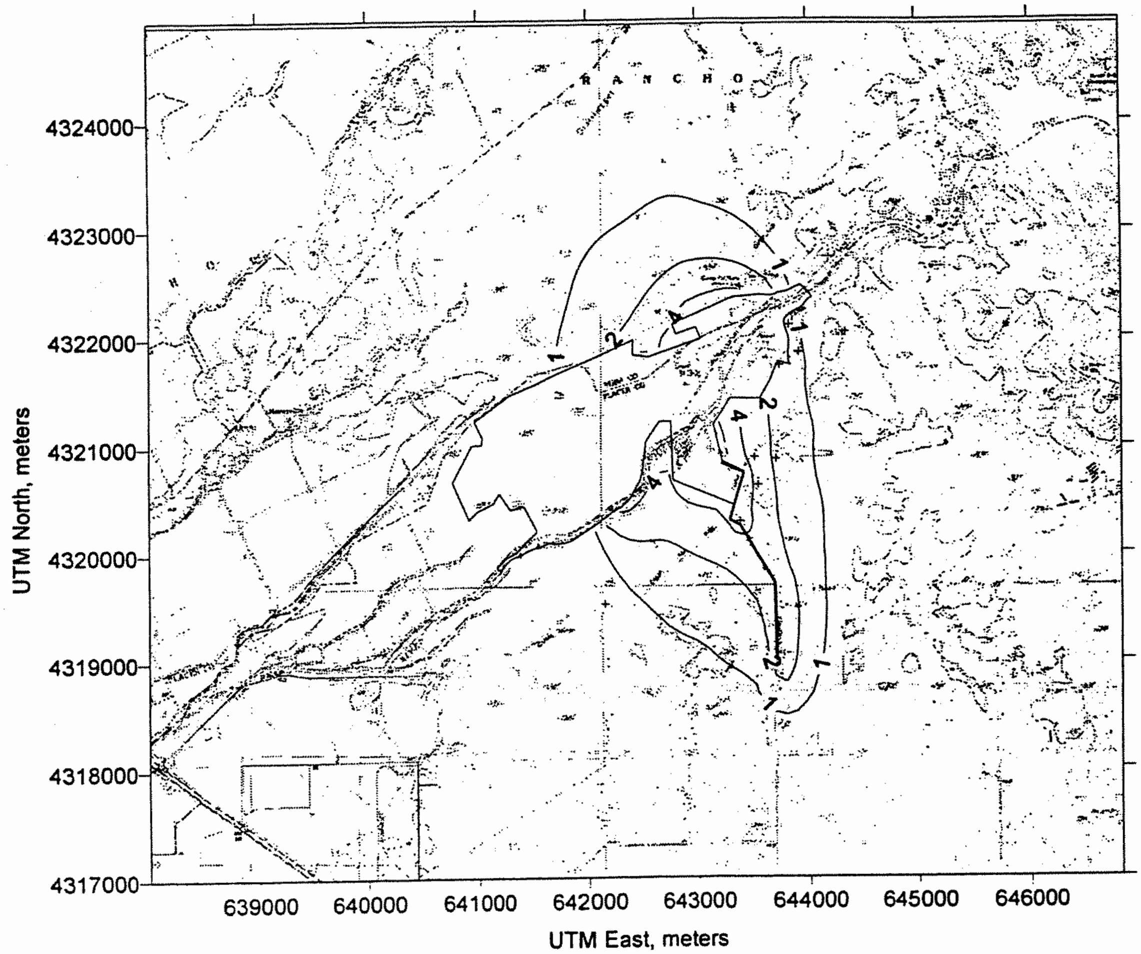


Figure 13

Patterson Sand & Gravel
Maximum Annual NO2 - 2005
ug/m3

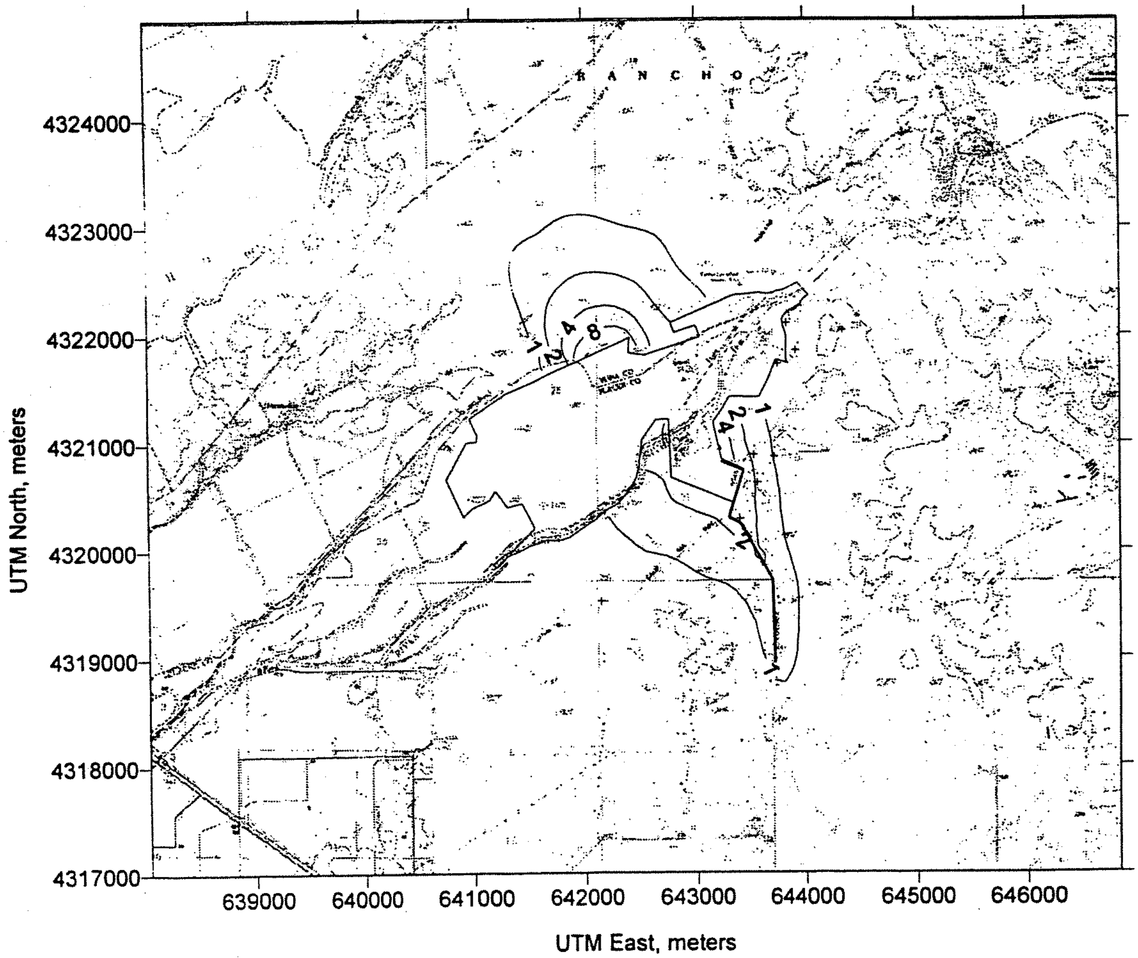


Figure 14

Patterson Sand & Gravel
Maximum Annual NO2 - 2010
ug/m3

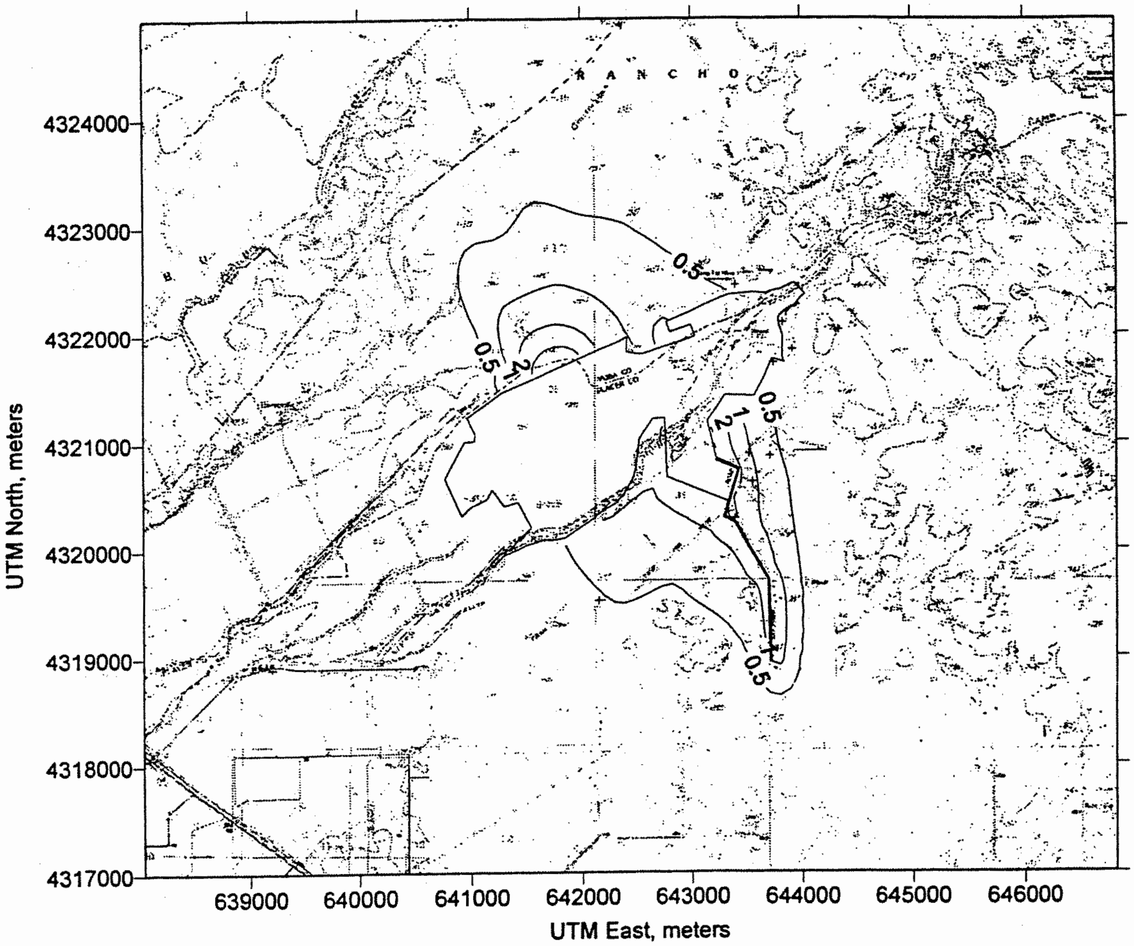


Figure 15

Patterson Sand & Gravel
Maximum Annual Diesel PM Risk
2001

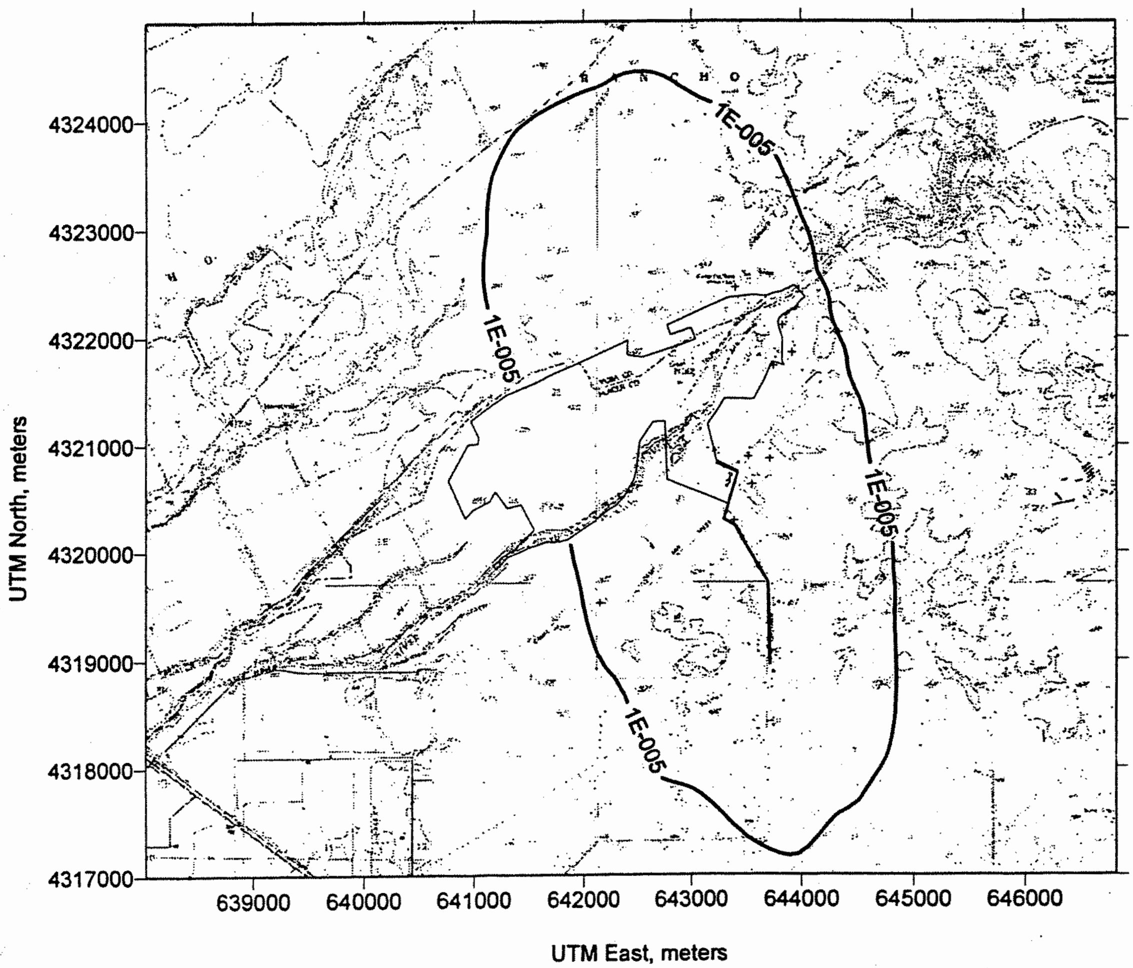


Figure 16

Patterson Sand & Gravel
Maximum Annual Diesel PM Risk
2005

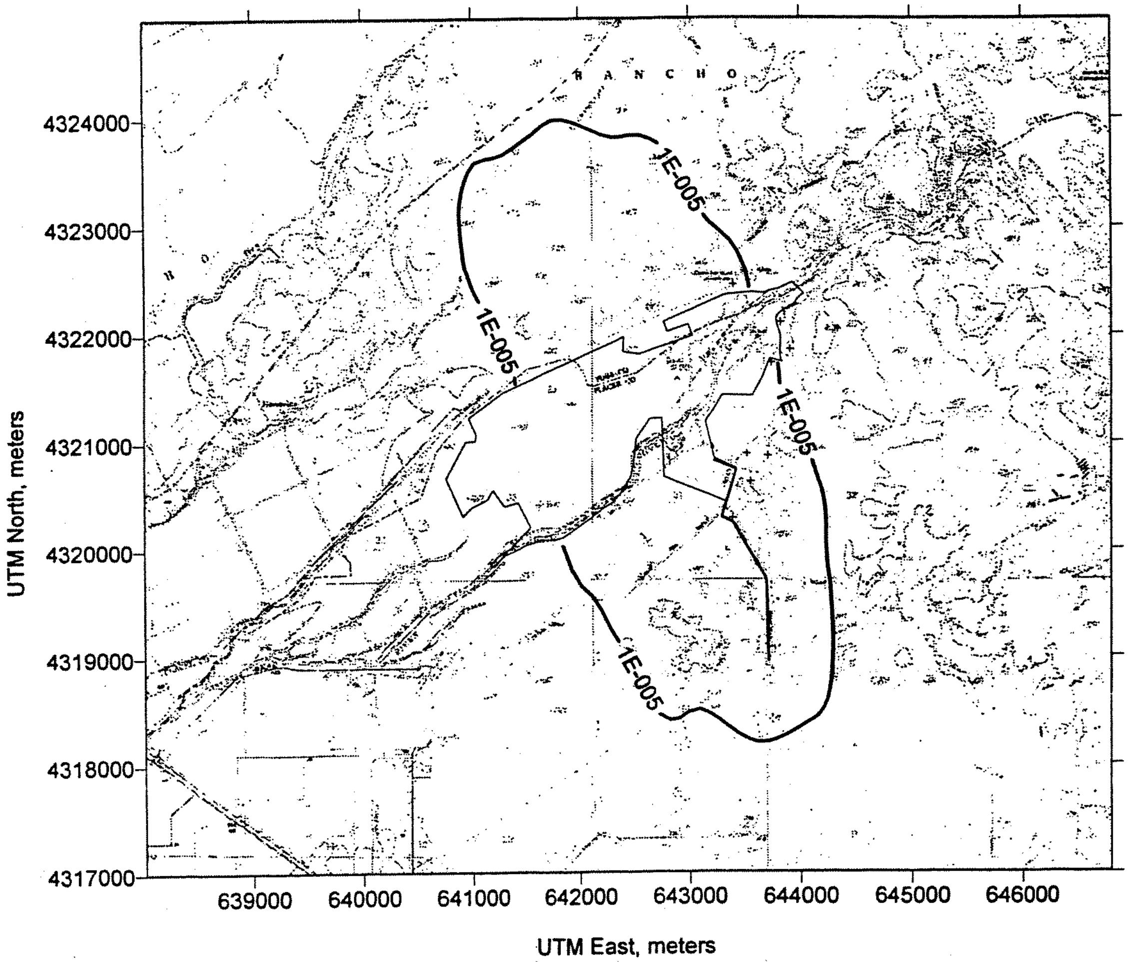
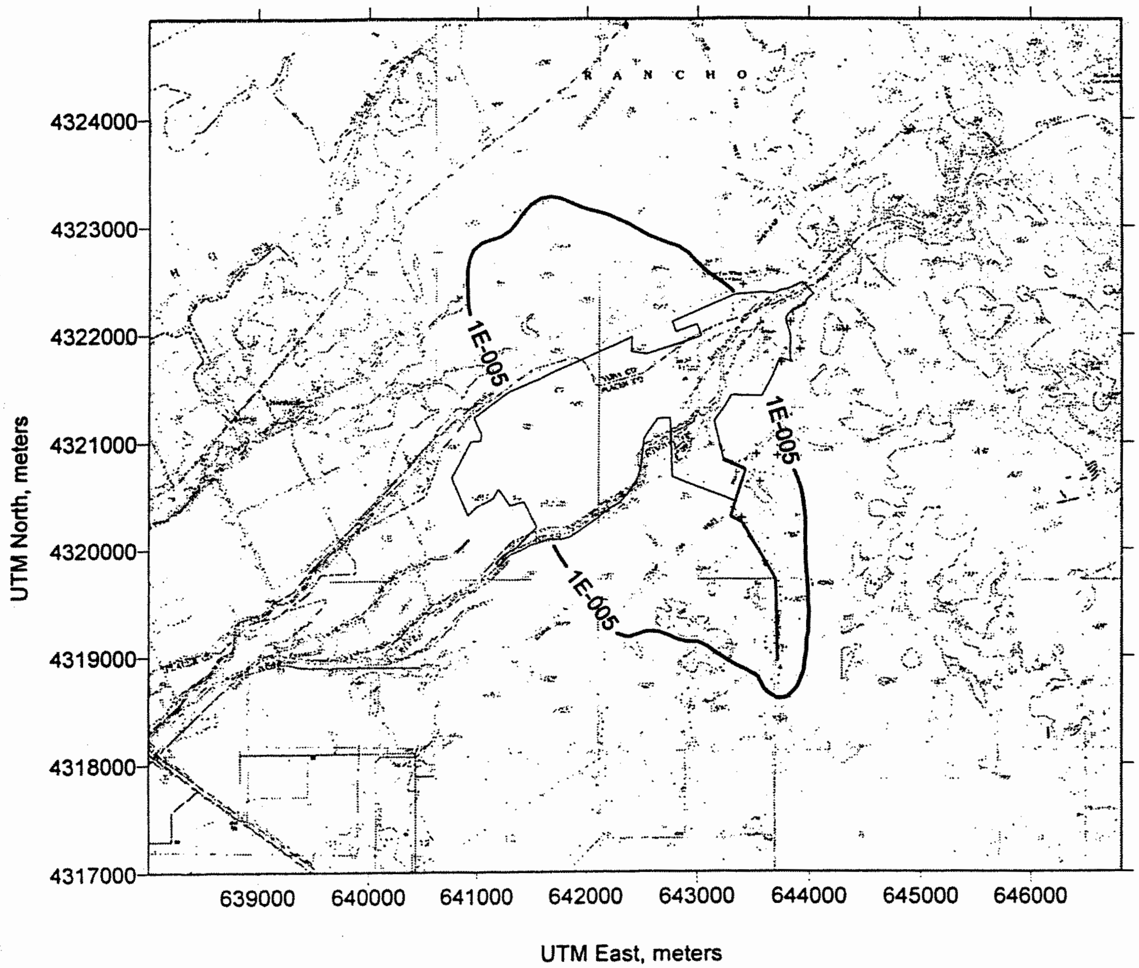


Figure 17

Patterson Sand & Gravel
Maximum Annual Diesel PM Risk
2010



E2. Supplemental Air Quality Impact Analyses

July 25, 2002

sierra research

1801 J Street
Sacramento, CA 95814
(916) 444-6666
Fax: (916) 444-8373

Memo To: Scott Goebl, EDAW

From: Earl Withycombe

Subject: Patterson Sand & Gravel Task Supplemental Air Quality Impact Analyses

Sierra Research agreed to undertake several supplemental air quality impact analyses for the Patterson Sand & Gravel expansion project. The following discussion includes those listed in the first three tasks under our proposal of June 4, 2002. The purpose of these tasks, and of this memo, is to present information needed in prioritizing the evaluation of additional mitigation measures for the control of PM_{10} and Diesel exhaust particulate emissions from the proposed project.

Evaluation of Pond Reclamation Impacts

Under this task, we evaluated the emissions and air quality impacts of reclaiming the existing silt settling pond located along the northern boundary of the Phase 1 mining area. This settling pond covers approximately 5.5 acres of previously excavated aggregate deposit, and is currently being used to accumulate silt separated from mined aggregate in the aggregate processing operation. This silt is transported in a slurry form from the processing area to the settling pond, where the silt settles out and the wash water is recirculated back to the aggregate processing area. When the silt level in the pond reaches the appropriate elevation, slurry feed to the pond will cease, and a layer of overburden soil removed from the Phase 2 mining area will be deposited on the surface of the silt bed to bring the finished grade up to the elevation of the undisturbed agricultural land adjacent to the pond. The overburden will be transported from the Phase 2 mining area by mine haul trucks, and the dumped overburden will be leveled by bulldozer.

Emissions will be generated by vehicle exhaust and by the dumping and spreading of overburden. These emissions will occur during the historical operating hours between 6:00 am and 5:00 pm. To cover the 5.47 acre pond silt surface with a two foot thick layer will require the transport and placement of 17,665 cubic yards of uncompacted overburden. At an uncompacted density of 60 pounds per cubic foot, approximately 14,300 tons of overburden will be required. Transport of this overburden from the Phase 2 mining area will require 14 days of mine truck hauling, assuming that the Caterpillar D400E mine haul trucks will transport 28.6 cubic yards of overburden per trip and that the haul frequency will be four trips per hour per truck.

Fugitive PM_{10} emissions from overburden dumping and spreading were calculated using emission factors published in EPA's emission factor compendium, AP-42.* Emissions calculations for these sources are presented in Attachment 1. Exhaust emissions rates for the bulldozer used to spread overburden at the pond reclamation site were calculated from emissions factors produced by the Sacramento Metropolitan Air Quality Management District's (SMAQMD) ROADMOD3** spreadsheet. Exhaust emission factors for 2005 were used in this calculation as the pond reclamation work is projected to occur during or close to 2005. Diesel exhaust emission calculations for the project are presented in Attachment 2. Summaries of emissions from these calculations are presented in Table 1.

Table 1
Pond Reclamation Emissions

Source	Fugitive PM_{10} Emissions		Diesel Exhaust PM Emissions
	lb/day	lb/yr	lb/yr
Overburden Dumping	0.12	3.5	
Overburden Spreading	40.4	444.7	
Bulldozer Exhaust			5.06

The emissions rates summarized in Table 1 were modeled using the EPA-approved Industrial Source Complex model, ISCST3 (Version 02035).*** This model can estimate the air quality impacts of single or multiple sources using actual meteorological conditions.

The model was configured with the following control parameters:

- Modeling switches: regulatory default
- Averaging periods: one-hour, 24-hour, and annual
- Choice of dispersion coefficients based upon land-use type: rural

*Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Fifth Edition, U.S. Environmental Protection Agency, January 1995

**Roadway Construction Emissions Model, Version 2.1, Sacramento Metropolitan Air Quality Management District, 2001.

***"User's Guide for the Industrial Source Complex (ISC3) Dispersion Models," U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, September 1995.

The surface-level meteorological data used in the modeling analysis were collected at Beale Air Force Base between 1991 and 1995. The inversion height data for this period were collected at the Oakland Airport. The Beale Air Force Base monitoring site is located approximately 8.7 miles north of the project boundary and is the closest meteorological monitoring station.

All of the emissions sources at the pond reclamation site were modeled as area sources. This choice of source configuration was based on the mobile character of overburden dumping and spreading activity.

Model runs were conducted for 24-hour PM_{10} impacts and annual Diesel exhaust PM impacts using 1992 and 1993 meteorological data, respectively. Modeling was limited to these scenarios as this analysis is being conducted to determine the sensitivity of overall facility air quality impacts to emissions generated by pond reclamation activities, and previous modeling efforts have indicated no violations of federal ambient air quality standards for other pollutants and averaging times. The 1992 and 1993 meteorological databases were chosen because these meteorological years produced the highest 24-hour PM_{10} and annual Diesel exhaust PM air quality impacts in the modeling of previous facility emission configurations.

Receptor sites for which impacts were assessed included both residential locations and networks of evenly spaced points adjacent to the facility boundary. As recommended by EPA modeling guidance,* two networks of receptors consisting of concentric fine and coarse grids were created. The fine grid network consisted of receptors spaced every 25 meters apart on the facility property boundary and on two concentric rings 25 and 50 meters out from the property boundary. A second rectangular grid of receptors evenly spaced every 150 meters, surrounding the fine grid out to a distance of 1 kilometer from the facility property boundary, was also created.

The modeling results indicate that peak impacts from pond reclamation activities will occur along the northern boundary of the settling pond, which is also a portion of the northern boundary of the facility. This area is on the opposite side of the facility from where the cumulative impacts were previously found to occur from simultaneous operation of the aggregate processing equipment and mining activities. The distributions of 24-hour PM_{10} impacts and Diesel exhaust PM risk adjacent to facility boundaries are presented in Attachment 3. The values for peak impacts and impacts occurring at locations of peak cumulative facility impact under previous modeling efforts are tabulated in Table 2 for the 24-hour PM_{10} and Diesel exhaust PM modeling runs.

These results indicate that reclamation activities will produce high impacts immediately adjacent to the boundaries of the settling pond, but that at locations where cumulative facility impacts are highest, reclamation activities will produce relatively low contributions.

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*Title 40, Code of Federal Regulations, Part 51, Appendix W, Guideline of Air Quality Models

Table 2 **Maximum 24-Hour PM_{10} Impacts and Annual Diesel Exhaust PM Risk From Pond Reclamation Activities**		
Receptor	Max. 24-Hour PM_{10} ($\mu g/m^3$)	Annual Diesel Exhaust PM 70-Year Cancer Risk
Peak Impact	74.7	4.8×10^{-8}
Impact at Phase 2 Peak Impact Site	5.6	3.0×10^{-8}

Evaluation of Access Road Paving Impacts

The access road connecting the facility entrance with the public road network is currently unpaved, but is proposed to be paved as part of the mining expansion project. Because the change in road surface will affect only fugitive PM_{10} emissions, this is the only pollutant analyzed in this evaluation. The facility operator currently waters the unpaved access road in mitigating dust emissions, and proposes to wash the road of trackout soil after paving is applied.

Emissions from use of the access road were computed using AP-42 emission factor equations and site-specific data. Unpaved road emission calculations were based on a silt content of 4.8%, a mean vehicle speed of 15 miles per hour, and a rainfall frequency of 90 days per year, as used in the Placer County Air Pollution District (District) Authority to Construct analysis for an earlier facility modification*; an average truck weight of 27.5 tons (the average of loaded and empty gross vehicle weights); and an average of 18 wheels per truck for a standard double bellydump tractor-trailer configuration. The emission factor estimated for unpaved road use based on these values is 2.2 pounds of PM_{10} per vehicle-mile traveled (VMT). The District estimated that road watering reduced unpaved road emissions by 99%, resulting in a controlled emission factor of 0.022 pounds of PM_{10} per VMT for trucks using the existing unpaved road.

The emission factor for paved road was derived from the work performed in the initial analysis of mining expansion project air quality impacts. This factor, 0.135 pound of PM_{10} per VMT, was based on a roadway silt content of 0.32 grams per square meter and an average vehicle weight of 27.5 tons. Since the initial analysis was performed, Sierra learned that the facility plans to frequently wash the road to remove soil trackout. Based on this information, an emission control factor of 90% is estimated to represent the effect of watering. The controlled PM_{10} emission factor is calculated to be 0.014 pounds of PM_{10} per VMT. The length of the access road is 221 meters, or 0.137 miles.

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*Patterson Sand and Gravel Portable Crusher Authority to Construct Evaluation, AC-97-57, Placer County Air Pollution Control District, December 30, 1998

The number of vehicle trips both for the existing facility and the proposed project have been estimated by EDAW. These values, together with the resulting PM_{10} emission rates under current and future operating scenarios, are presented in Table 3.

Table 3
Access Road Maximum 24-Hour Fugitive PM_{10} Emissions

Road Scenario	Maximum One-Way Trips	Maximum PM_{10} Emissions, lb/day
Unpaved	1,126	3.40
Paved	920	1.70

PM_{10} emission impacts from the unpaved and paved access road scenarios were modeled with ISCST3 in the same manner as for the pond reclamation emissions. The distribution of maximum 24-hour PM_{10} impacts adjacent to facility boundaries under each scenario is presented in Attachment 4. The values for peak impact and the impact occurring at the location of peak cumulative facility impact under the previous modeling effort are tabulated in Table 4 for the 24-hour PM_{10} modeling run under the two scenarios.

Table 4
Maximum 24-Hour PM_{10} Impacts From Unpaved and Paved Access Road Travel

Receptor	Maximum 24-Hour PM_{10}, $\mu g/m^3$	
	Unpaved Access Road	Paved Access Road
Peak Impact	2.8	1.4
Impact at Phase 2 Peak Impact Site	1.6	0.8

The modeling results indicate that the peak impacts from the access road will occur along the eastern side of the road, and that the maximum impact site is close to that where cumulative facility impacts reach a maximum value. The PM_{10} emission rates from the access road under either the unpaved or paved scenarios are relatively small compacted to total facility emissions when the Phase 2 mining area is in operation, and the resulting air quality impacts from access road travel will correspondingly be small compared to those of cumulative facility emissions.

Sensitivity Analysis of Initial Modeling Results

Initial modeling results indicated that 24-hour PM_{10} concentrations and annual Diesel exhaust PM cancer risks related to proposed facility operations and peak background conditions exceeded federal ambient air quality standards and acceptable risk standards, respectively. In order to determine which facility sources should be targeted for mitigation to reduce these impacts, Sierra proposed to conduct a sensitivity analysis of the initial modeling results to evaluate the magnitude of needed reductions. This review summarizes the results of the sensitivity analysis.

24-Hour PM_{10} Impacts:

Maximum 24-hour PM_{10} impacts predicted by the ISCST3 model to occur during mining of Phases 2, 3, 6 and 7, when combined with the maximum background 24-hour PM_{10} level recorded at the Lincoln monitoring station, all exceeded the federal 24-hour PM_{10} ambient air quality standard of 150 $\mu g/m^3$. The meteorological modeling year that generally produced the highest 24-hour average facility impacts under each mining scenario was 1992. In order to determine the contribution of each facility source to these modeled peak values, the input files for the various mining scenarios under 1992 meteorological conditions were reconfigured to separately report the air quality impacts of each source and rerun with ISCST3. The individual sources that were modeled in the various mining scenarios were the aggregate processing area, the Phase 2, 3, 6, and 7 mining areas, the asphalt drum mix plant, the Diesel-powered water pump, and that portion of the delivery haul route over public roads within 1.5 miles of the facility entrance.

The maximum 24-hour PM_{10} impacts from each of the facility sources and each of the mining scenarios modeled separately are tabulated in Table 5.

Table 5
Maximum 24-Hour PM_{10} Impacts
Under Various Mining Phase Scenarios

Source	Phase 2	Phase 3	Phase 6	Phase 7
Maximum 24-Hour PM_{10} Impact, $\mu g/m^3$				
Aggregate Processing Area	52.9	53.2	53.2	50.2
Mining Area	40.1	36.3	48.6	31.5
Asphalt Drum Mix Plant	2.1	2.1	2.1	2.1
Diesel Pump	0.6	0.6	0.6	0.6
Haul Trucks on Public Roads	139.3	139.1	139.1	139.1

Table 5 **Maximum 24-Hour PM_{10} Impacts Under Various Mining Phase Scenarios**				
Source	Phase 2	Phase 3	Phase 6	Phase 7
All Sources Combined	139.3	139.1	139.1	147.0
Maximum 24-Hour Impact at Combined Source Peak Impact Site, $\mu g/m^3$				
Aggregate Processing Area	25.4	25.5	25.5	24.1
Mining Area	3.7	2.8	10.2	19.3
Asphalt Drum Mix Plant	0.3	0.3	0.3	0.3
Diesel Pump	0.2	0.2	0.2	0.2
Haul Trucks on Public Roads	139.3	139.1	139.1	139.1
All Sources Combined	139.3	139.1	139.1	147.0

The results of this analysis point to several conclusions. The ISCST3 model, in computing maximum 24-hour impacts, reports the highest single day/single receptor impact over all meteorological days and receptor points included in the input file. Thus, while haul trucks operating on public roads produced a maximum impact at the intersection of the facility entry road and Camp Far West Road on December 22, 1992, for example, operations within the aggregate processing area produced a corresponding maximum impact about 230 meters (770 feet) north-northwest of the facility entrance gate on September 16, 1992. Because of the differences in time and location that are reported for maximum impacts by the model, the results from separate analyses of individual sources are not additive.

Modeling results indicate that the maximum impact produced by all facility sources operating simultaneously is generally the same as that of the haul trucks operating on public roads when modeled separately. Moreover, the maximum impacts for these source combinations are reported to occur on the same day at the same receptor site. Thus, on a day when haul truck impacts produce a PM_{10} maximum concentration, the impacts of other facility sources are essentially zero on that same day at the peak impact location. Examination of the meteorological data for that day indicate the wind directions during hours of facility operation (6:00 am to 5:00 pm) were from the southwest and north, which would have blown emissions from the processing area, the mining area, the asphalt drum mix plant, and the Diesel pump to the north and west of the peak receptor point. Only in the case of the Phase 7 mining scenario, where mining is occurring directly west and adjacent to the site of highest PM_{10} impact, does a source other than haul truck travel contribute to the maximum estimated impact.

Because the combination of all facility sources generally produced the same impact on the same day and at the same location as the haul trucks on public roads did separately, the modeling results suggest that this peak impact is being dominated by one source, the haul route over public roads. Alternatives for reducing the impacts from this source include, among others, a closer examination of the haul truck fugitive PM_{10} emission factor used in emissions calculations, and a reexamination of the need to include public roads near the facility as a project-affected source. Reevaluation of the haul truck emission factor would require use of a revised paved road silt loading approved by the Placer County Air Pollution Control District or the possible measurement of silt loadings near the facility. With respect to a reexamination of the need to include public roads in the modeling effort, this source was included in the original air quality impact analysis conducted by Sierra as it was understood that the installation and operation of an asphalt drum mix plant would cause increases in haul truck traffic to and from the facility. Subsequent traffic projections have indicated, to the contrary, that traffic levels will decline under the proposed project. Because of this finding, it is now questionable whether offsite haul truck emissions should be considered part of the project as decreases in truck trip levels and corresponding emissions will provide an environmental benefit, not an adverse environmental impact. If a determination is made that public roads near the facility used for hauling raw asphalt and aggregate products should not be considered a part of the proposed project, then subsequent sensitivity modeling can be performed with this source omitted to determine new cumulative PM_{10} impacts and contributions from facility sources.

Diesel Exhaust PM Risks:

In our original assessment, the maximum annual Diesel exhaust PM impacts predicted to occur during mining of the Phase 2 and Phase 3 mining areas at an occupied residence were 0.173 and 0.148 $\mu g/m^3$, respectively. No background concentration of Diesel exhaust PM was included in the analysis of air quality impacts as regulations limiting or requiring the reporting of impacts from sources of toxic air contaminants do not require consideration of background concentrations.* Also, no analyses of Diesel exhaust PM impacts were conducted for the Phase 6 and 7 mining scenarios as these activities are scheduled to occur after 2020, which is the predictive limit of current emission factor models. The above calculated ambient concentrations would produce a 70-year increased cancer risk of 5.19×10^{-4} and 4.44×10^{-4}, respectively, based on a Diesel exhaust PM unit risk factor of 3×10^{-4} per $\mu g/m^3$. By comparison, the Proposition 65 cancer risk reporting threshold is 1×10^{-5} annual average impact at a residence or workplace. The meteorological modeling year that produced the highest facility impacts was 1993. In order to determine the contribution of each facility source to total impacts, the input files for the Phase 2 and 3 mining scenarios under 1993 meteorological conditions were reconfigured to separately report the air quality impacts of each source and rerun with ISCST3. The individual sources that were modeled in each scenario were the aggregate processing area, the mining area, the Diesel-powered water pump, and that portion of the

*Risk management thresholds are established at levels low enough to insure that both individual and cumulative risks are not significant.

delivery haul route over public roads within 1.5 miles of the facility entrance. The pond reclamation area was included in the Phase 2 analysis as well.

Subsequent to completion of the earlier analysis of Diesel exhaust PM emissions and impacts, Sierra learned that some items of earthmoving equipment that were assumed to operate in the mining pits were, in fact, assigned to work only in the aggregate processing area. Therefore, emissions from these vehicles were reassigned to this latter area prior to running the ISCST3 model, and the cumulative source impact was different than that reported in earlier analyses. The maximum annual Diesel exhaust PM impacts from facility sources reported by the ISCST3 model are separately tabulated in Table 6.

Table 6
Maximum Annual Diesel Exhaust PM Impacts
Under Two Mining Phase Scenarios

Source	Phase 2	Phase 3
Maximum Annual Impact, $\mu g/m^3$		
Aggregate Processing Area	0.124	0.074
Mining Area	0.021	0.024
Pond Reclamation	0.0002	NA
Diesel Pump	0.022	0.022
Haul Trucks on Public Roads	0.063	0.053
All Sources Combined	0.219	0.148
Maximum Annual Impact at Combined Source Peak Impact Site, $\mu g/m^3$		
Aggregate Processing Area	0.124	0.074
Mining Area	0.021	0.011
Pond Reclamation	0.0001	NA
Diesel Pump	0.011	0.011
Haul Trucks on Public Roads	0.063	0.053
All Sources Combined	0.219	0.148

The results of the Diesel exhaust PM impact analysis are much more consistent than those of the 24-hour PM_{10} analysis for two reasons. First, since an annual impact was assessed, the peak impacts from each source occur during the same timeframe. Second, since there were only ten receptors at which impacts were assessed, and because none were significantly closer to one source boundary versus another, none of the receptor impacts were dominated by one source to the exclusion of others. Modeling results indicate that the maximum impact from most of the contributing sources, and that of the combined sources operating simultaneously, generally occur at the same residential receptor, located near the intersection of Camp Far West Road and Porter Road. Because of these conditions, the analysis of source mitigation on impacts at the maximally exposed receptor is more straightforward. Also, because the impacts from the Phase 2 mining scenario are higher than those of Phase 3, by virtue of the fact that Diesel exhaust emission factors are higher when Phase 2 is mined in 2005 versus Phase 3 in 2010, the remaining sensitivity analysis focuses exclusively on the Phase 2 scenario.

The maximum receptor impact of 0.219 $\mu g/m^3$ of Diesel exhaust PM during the Phase 2 mining scenario is equivalent to a 70-year increased cancer risk of 6.6×10^{-5}. The target cancer risk to which project emissions should be reduced is the Proposition 65 warning threshold of 1.0×10^{-5}. The first test of mitigation was made by assuming that run-of-pit material excavated from the Phase 2 mining area would be transported via belt conveyor to the aggregate processing area. Under this scenario, the Diesel pump that is used to recirculate water from the settling pond to the processing area would be converted to electric power. The mine haul trucks contribute 57.3% of the Phase 2 mining area Diesel exhaust PM emissions, and 52.0% of the aggregate processing area emissions. Substitution of a conveyor belt for the use of these vehicles in transporting run-of-pit material to the aggregate processing, and substitution of an electric motor for the Diesel engine powering the recirculating water pump, may reduce Diesel exhaust PM cancer risks by 42.3%. If onsite Diesel vehicles are fueled with a Diesel-water emulsion fuel (PuriNOx) certified by the California Air Resources Board to reduce Diesel exhaust PM emissions by 62.9%,* then overall Diesel exhaust PM cancer risks may be reduced by another 18.1% to 2.6×10^{-5}. The final estimates of cancer risk reduction cannot be developed until the ISCST3 model is rerun with the final estimates of mitigated Diesel exhaust PM emissions. The reductions in cancer risk roughly estimated through use of a linear rollback calculation from implementation of these two control strategies for each source are presented in Table 7.

Table 7
Reductions in Cancer Risk at Point of Maximum Facility Impact Through The Use of Conveyor Belts and PuriNOx Fuel for Phase 2

Source	Initial Cancer Risk	Conveyor Reductions	PuriNOx Reductions	Mitigated Cancer Risk
Aggregate Processing Area	3.73×10^{-5}	52%	62.9%	0.664×10^{-5}
Phase 2 Mining Area	0.629×10^{-5}	57%	62.9%	0.100×10^{-5}

*Letter from Dean Simeroth, Chief, Criteria Pollutants Branch, CARB to Thomas Sheahan, Managing Director, Legislative and Regulatory, The Lubrizol Corporation, dated January 31, 2001.

Table 7
Reductions in Cancer Risk at Point of Maximum Facility Impact Through The Use of Conveyor Belts and PuriNOx Fuel for Phase 2

Source	Initial Cancer Risk	Conveyor Reductions	PuriNOx Reductions	Mitigated Cancer Risk
Pond Reclamation	0.004×10^{-5}	0%	62.9%	0.001×10^{-5}
Diesel Pump	0.322×10^{-5}	100%	0%	0
Haul Trucks on Public Roads	1.89×10^{-5}	0%	0%	1.89×10^{-5}
All Sources Combined	6.58×10^{-5}			2.66×10^{-5}

The results presented in Table 7 indicate that the Proposition 65 reporting threshold cannot be attained without reducing, or discounting, the emissions of haul trucks on public roads. This source alone produces impacts that almost double the reporting threshold. Onsite sources of Diesel exhaust PM emissions, after the implementation of the two reduction strategies proposed, would alone produce a maximum cancer risk of 0.764×10^{-5}, which is below the Proposition 65 reporting level.

An alternative strategy for reducing the impacts of onsite Diesel-powered equipment is a careful reanalysis of Diesel exhaust PM emissions from onsite vehicles. The estimates of offroad Diesel vehicle use within the facility boundaries that served as the basis for the original risk modeling indicate that total Diesel fuel consumption should be approximately 2,500,000 gallons. This estimate is based on all equipment operating 11 hours per day, 288 days per year, at industry-wide load factors (ranging from 44% to 67% of full rated power). By comparison, the facility reported that calendar year 2000 Diesel fuel use was 395,657 gallons while producing 1,548,000 tons of aggregate products. The disparity between actual and estimated fuel use suggests that the original emission assumptions significantly overestimate equipment use and corresponding emissions. While such analysis might obviate the need to pursue emission reduction strategies with respect to onsite equipment, it will not affect the impacts caused by on-highway haul trucks serving the facility.

Conclusions

The results of the emission and air quality impact analyses for the pond reclamation and access road paving projects suggest that these sources will not contribute significantly to previously estimated cumulative facility air quality impacts. Both of these projects will be included in any modeling of cumulative facility impacts after final mitigation strategies are selected.

The sensitivity analysis of facility sources reveals that haul truck emissions on public roads near the facility separately produce concentrations of PM_{10} and Diesel exhaust PM that result in exceedance of applicable standards or significance criteria under both the baseline and mining expansion scenarios. Because Diesel exhaust PM emission factors are lower and the number of haul truck trips smaller under the mining expansion scenarios, however, Diesel exhaust PM risk impacts are higher in the baseline case than in the future scenarios. The final risk impact reduction estimates will be produced by the ISCST3 model when final decisions on emission reduction strategies are made.

If you have any questions regarding these analyses, please contact me.

Attachment 1

Pond Reclamation Fugitive PM_{10} Emission Calculations

Pond Reclamation Emissions

Overburden Dumping Emission Factor

Source: AP-42, Section 13.2.4-3, 1/95

E = (k)(0.0032)[(U/5)^1.3]/[(M/2)^1.4]

k = particle size constant =	0.35	for PM10
U = average wind speed =	5.76	mph (Wind in California, DWR Bulletin No. 185, 1/78, Beale AFB))
M = moisture content =	8%	(L. Burns, 6/20/02)
E = emission factor =	0.0001932	lb/ton

Overburden Dumping Activity Rate

Source: Lloyd Burns, 6/20/02

Pond Reclamation Area =	5.47	acres
Overburden Depth =	2	feet
Overburden Volume =	476,948	ft3
Compacted Overburden Weight =	75	lb/ft3 (estimated)
Total Overburden Dumped =	17,886	tons
Haul Truck Payload =	29	yd3/load (Caterpillar website @ http://www.cat.com/index.html)
Number of Daily Operating Hours =	11	hr/day
Number of Operating Days =	14.2	day/yr

Overburden Dumping Emission Rate

PM10 Emission Rate =	3.46	lb/yr
=	0.243	lb/day

Overburden Spreading Emission Factor

Source: AP-42, Tables 13.2.3-1 and 11.9.2, 1/95 (bulldozing)

E = (0.75)(s^1.5)/(M^1.4)

s = silt content =	63%	(L. Burns, 6/20/02)
M = moisture content =	8%	(L. Burns, 6/20/02)
E = emission factor =	20.21	lb/hr

Overburden Spreading Activity Rate

Source: Lloyd Burns, 6/20/02

Number of Bulldozers =	1

Daily Operating Hours =	11 hr/day-bulldozer (estimated)
Total Daily Operating Hours =	11 bulldozer-hr/day
Number of Operating Days =	10 day/yr
Number of Annual Operating Hours =	110 bulldozer-hr/yr

Overburden Spreading Control Efficiency

Source: Control of Open Fugitive Dust Sources, U.S EPA, 9/88

Prewatering Control Efficiency = 80% (estimated)

Overburden Spreading Emission Rate

Controlled PM10 Emission Rate =	4.04 lb/hr
=	40.4 lb/day
=	444.7 lb/yr

Attachment 2

Facility Diesel Exhaust PM Emission Calculation
Including Pond Reclamation Activities

Existing & Phase 1 (Year 2001)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	11	22	9.65	58.03	3.17	65.75	1.74
off-highway truck	5	11	55	24.06	151.11	8.42	176.14	4.33
scraper/earthmover	1	11	11	7.20	45.98	2.58	54.14	1.30
dozer	2	11	22	4.60	17.95	1.01	17.03	0.83
wheeled loader	1	11	11	2.48	17.12	0.99	21.09	0.45
Subtotal, Mining Area				35.96	214.63	11.97	246.07	6.47
Subtotal, Processing Area				12.03	75.56	4.21	88.07	2.17
Facility Total, Pounds/Day				**48.00**	**290.18**	**16.18**	**334.14**	**8.64**

*Based on typically daily hours of operation. Assumes 11 hrs/day.

ANNUAL EMISSIONS

Mining/Reclamation Equipment	Number	Hrs/Yr	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	3172	6344	2,782.35	16,733.87	914.20	18,959.75	500.82
off-highway truck	5	3172	15860	6,938.75	43,575.35	2,428.56	50,791.65	1,248.98
scraper/earthmover	1	3172	3172	2,076.90	13,257.58	744.22	15,611.40	373.84
dozer	2	3172	6344	1,326.91	5,174.95	291.92	4,909.57	238.84
wheeled loader	1	3172	3172	715.38	4,936.11	286.15	6,080.72	128.77
Tons/Year				**6.92**	**41.84**	**2.33**	**48.18**	**1.25**

Phases 2 (Year 2005)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	11	22	9.65	40.94	1.79	33.22	1.74
off-highway truck	5	11	55	24.06	121.28	6.02	119.35	4.33
scraper/earthmover	1	11	11	7.20	38.53	1.98	39.97	1.30
dozer	1	11	11	2.30	8.97	0.51	8.51	0.41
dozer, pond reclamation	1	11	11	2.30	8.97	0.51	8.51	0.41
wheeled loader	1	11	11	2.48	14.33	0.76	15.60	0.45
Subtotal, Mining Area				33.66	163.41	8.05	156.98	6.06
Subtotal, Processing Area				12.03	60.64	3.01	59.68	2.17
Facility Total, Pounds/Day				**48.00**	**233.02**	**11.56**	**225.17**	**8.64**

*Based on typically daily hours of operation. Assumes 11 hrs/day.

ANNUAL EMISSIONS

Mining/Reclamation Equipment	Number	Hrs/Yr	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	3172	6344	2,782.35	11,805.13	516.72	9,579.24	500.82
off-highway truck	5	3172	15860	6,938.75	34,971.30	1,734.69	34,416.20	1,248.98
scraper/earthmover	1	3172	3172	2,076.90	11,111.44	571.15	11,526.82	373.84
dozer	2	3117	6234	1,303.90	5,085.22	286.86	4,824.44	234.70
dozer, pond reclamation	1	110	110	23.01	89.73	5.06	85.13	4.14
wheeled loader	1	3172	3172	715.38	4,131.31	219.08	4,497.94	128.77
Tons/Year				**6.92**	**33.60**	**1.67**	**32.46**	**1.25**

Phases 3-7 (Post-2010)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	11	22	9.65	24.26	1.45	25.09	1.74
off-highway truck	5	11	55	24.06	69.78	3.61	62.56	4.33
scraper/earthmover	1	11	11	7.20	23.83	1.23	22.27	1.30
dozer	2	11	22	4.60	15.21	1.01	17.03	0.83
wheeled loader	1	11	11	2.48	9.68	0.37	6.45	0.45
Subtotal, Mining Area				35.96	107.87	5.87	102.11	6.47
Subtotal, Processing Area				12.03	34.89	1.80	31.28	2.17
Facility Total, Pounds/Day				**48.00**	**142.76**	**7.67**	**133.39**	**8.64**

*Based on typically daily hours of operation. Assumes 11 hrs/day.

ANNUAL EMISSIONS

Mining/Reclamation Equipment	Number	Hrs/Yr	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	3172	6344	2,782.35	6,995.63	417.35	7,234.12	500.82
off-highway truck	5	3172	15860	6,938.75	20,122.38	1,040.81	18,040.75	1,248.98
scraper/earthmover	1	3172	3172	2,076.90	6,871.09	354.80	6,421.10	373.84
dozer	2	3172	6344	1,326.91	4,387.10	291.92	4,909.57	238.84
wheeled loader	1	3172	3172	715.38	2,789.98	107.31	1,859.98	128.77
Subtotal, Mining Area				10,370.92	31,104.99	1,691.79	29,445.15	1,866.77
Subtotal, Processing Area				3,469.38	10,061.19	520.41	9,020.38	624.49
Tons/Year				**6.92**	**20.58**	**1.11**	**19.23**	**1.25**

Mining/Reclamation Equipment - 2001	HP rating	Load Factor	ROG	NOx	PM10	CO	SOx	
excavator	343	58%	0.439	2.638	0.144	2.989	0.079	lb/hr
off-highway truck	405	49%	0.438	2.748	0.153	3.203	0.079	lb/hr
scraper/earthmover	450	66%	0.655	4.180	0.235	4.922	0.118	lb/hr
dozer	165	58%	0.209	0.816	0.046	0.774	0.038	lb/hr
wheeled loader	220	47%	0.226	1.556	0.090	1.917	0.041	lb/hr

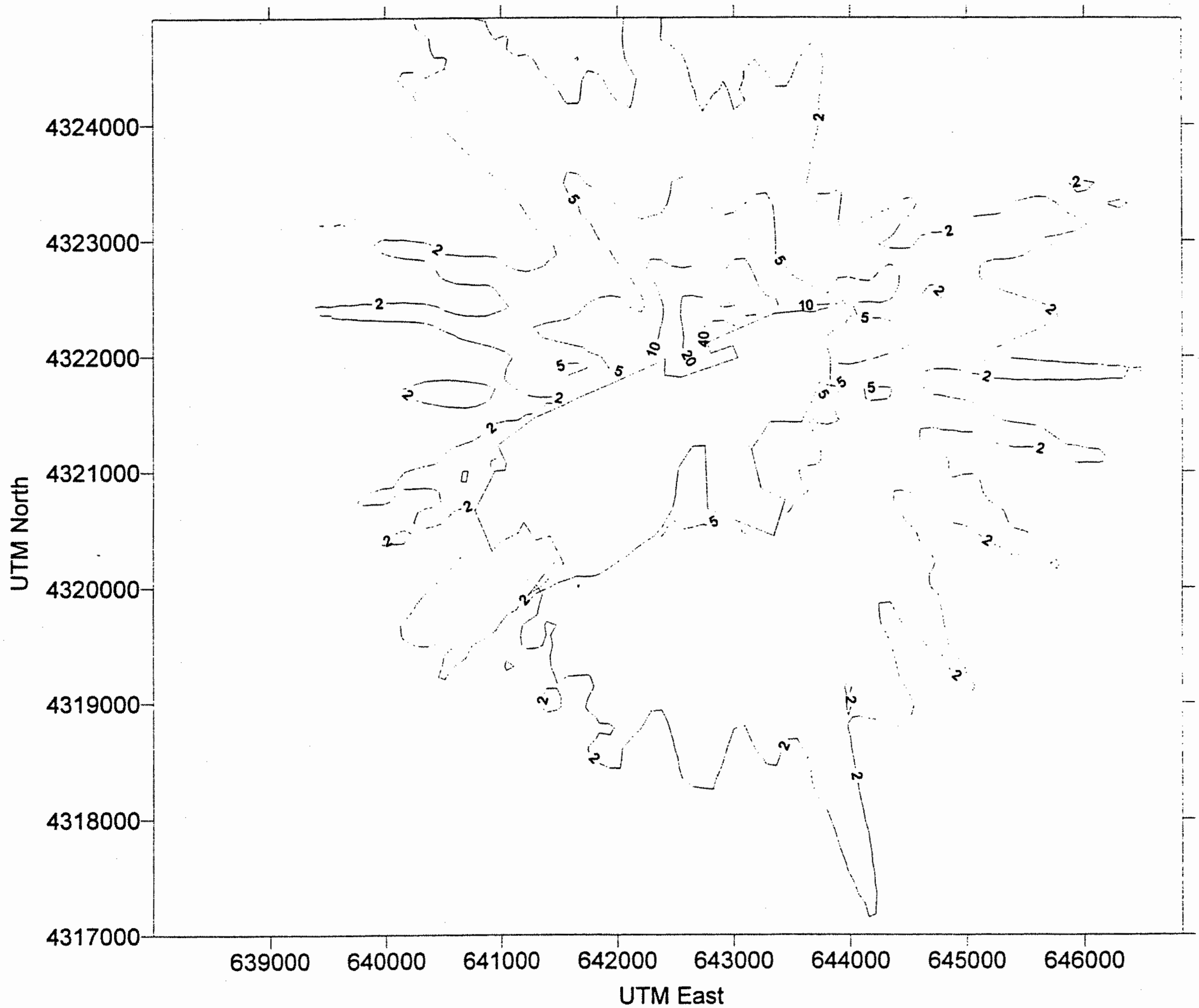
Mining/Reclamation Equipment - 2005	HP rating	Load Factor	ROG	NOx	PM10	CO	SOx	
excavator	343	58%	0.439	1.861	0.081	1.510	0.079	lb/hr
off-highway truck	405	49%	0.438	2.205	0.109	2.170	0.079	lb/hr
scraper/earthmover	450	66%	0.655	3.503	0.180	3.634	0.118	lb/hr
dozer	165	58%	0.209	0.816	0.046	0.774	0.038	lb/hr
dozer, pond reclamation	165	58%	0.209	0.816	0.046	0.774	0.038	lb/hr
wheeled loader	220	47%	0.226	1.302	0.069	1.418	0.041	lb/hr

Mining/Reclamation Equipment - 2010	HP rating	Load Factor	ROG	NOx	PM10	CO	SOx	
excavator	343	58%	0.439	1.103	0.066	1.140	0.079	lb/hr
off-highway truck	405	49%	0.438	1.269	0.066	1.138	0.079	lb/hr
scraper/earthmover	450	66%	0.655	2.166	0.112	2.024	0.118	lb/hr
dozer	165	58%	0.209	0.692	0.046	0.774	0.038	lb/hr
wheeled loader	220	47%	0.226	0.880	0.034	0.586	0.041	lb/hr

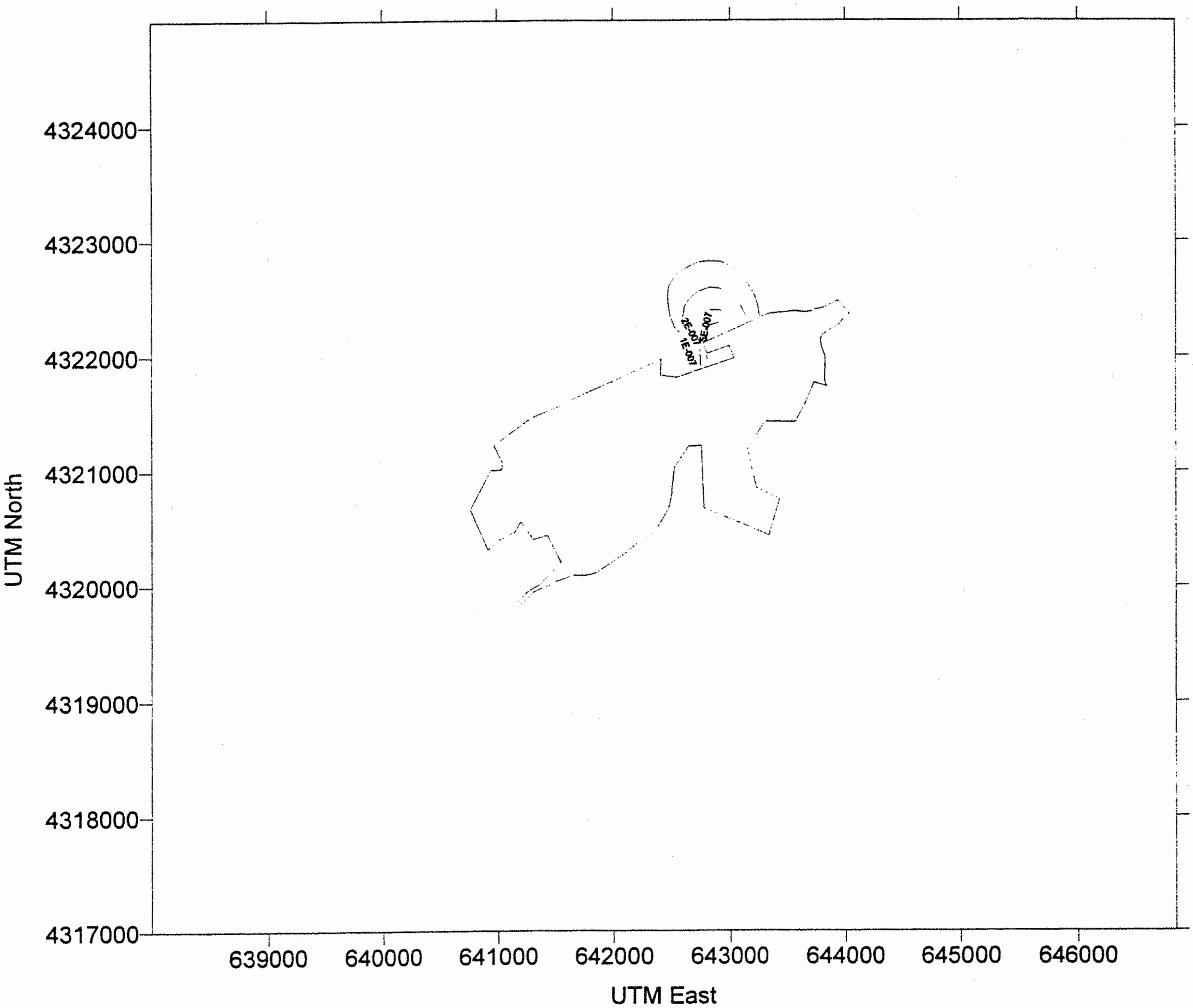
Attachment 3

Pond Reclamation PM_{10} and Diesel Exhaust PM Risk Impacts

Patterson Sand & Gravel
1992 Max. 24-Hour PM10 - Pond Reclamation
ug/m3



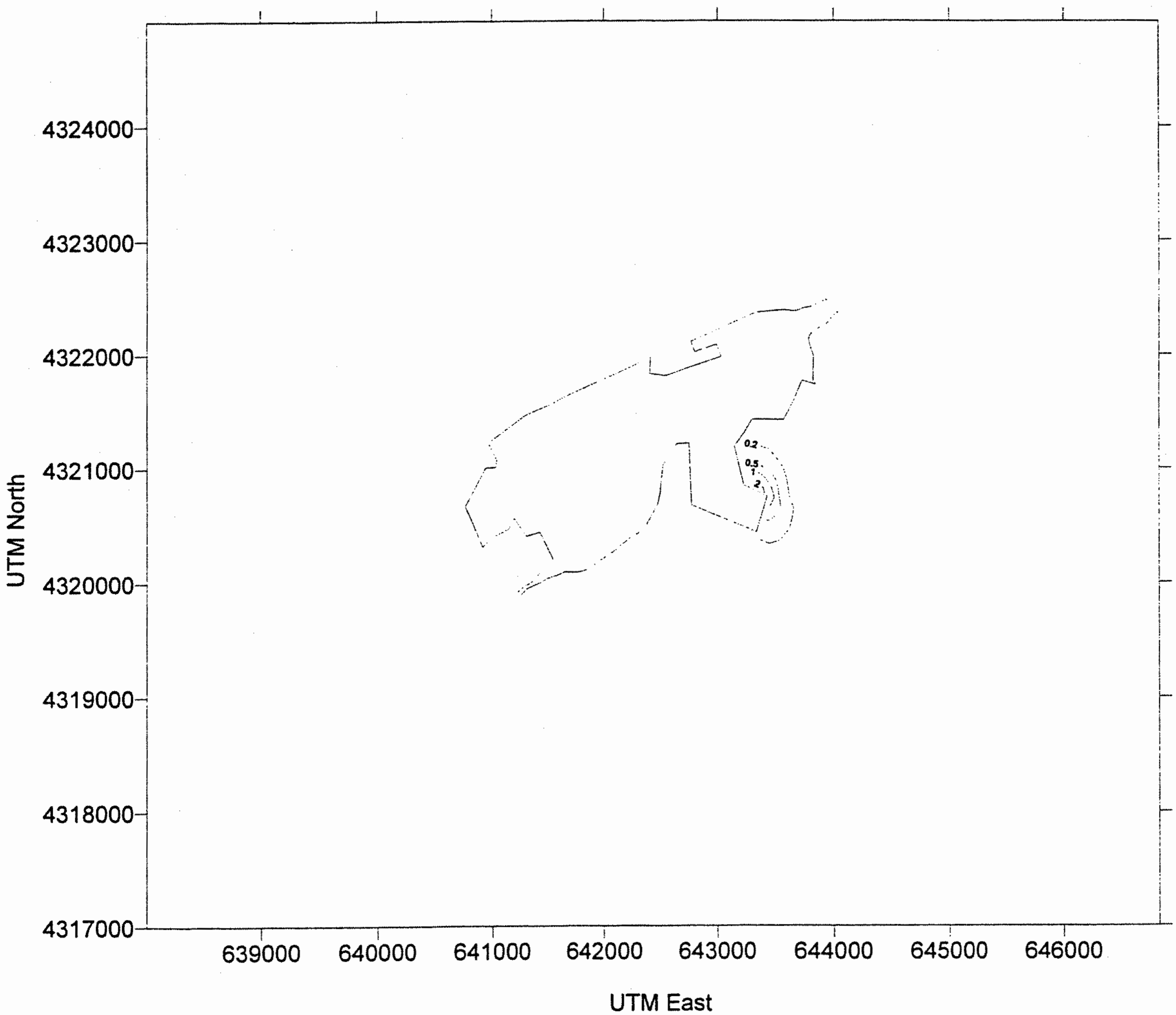
Patterson Sand & Gravel
1993 Diesel Exhaust PM Risk - Pond Reclamation



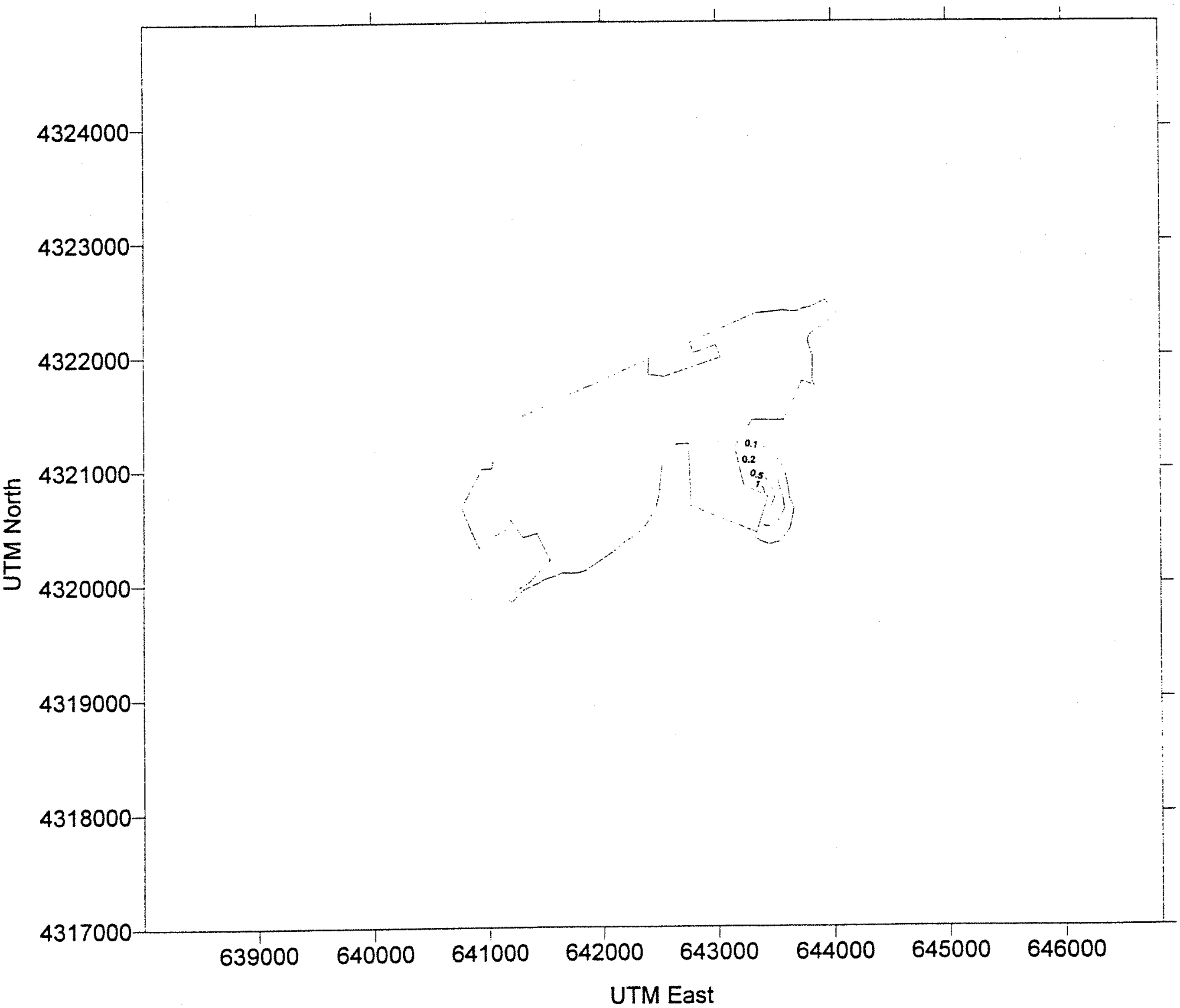
Attachment 4

Unpaved and Paved Access Road PM_{10} Impacts

Patterson Sand & Gravel
1992 Max. 24-Hour PM10 - Unpaved Access Road
ug/m3



Patterson Sand & Gravel
1992 Max. 24-Hour PM10 - Paved Access Road
ug/m3



E3. Emissions Data

SHORT-TERM CONSTRUCTION EMISSIONS-ONSITE ACTIVITIES

Diesel Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
scraper/earthmover	2	8	16	3.59	25.58	1.3	19.64	0.95
wheeled dozer	2	8	16	3.58	29.87	1.49	18.42	0.305
wheeled loader	2	8	16	1.35	8.04	0.26	11.52	0.33
			Subtotal lbs/day	8.52	63.49	3.05	49.58	1.59
Offsite Mobile Source Emissions								
	Trips	Trip length	Miles/day		Emission Factor (g/mile)			
Employee	20	20	400	0.069	0.594	0.017	3.34	0.003
Truck	32	50	1600	0.597	16.046	0.284	2.326	0.188
Employee trips				0.06	0.52	0.01	2.95	0.00
Truck trips				2.11	56.60	1.00	8.20	0.66
			Subtotal lbs/day	2.17	57.12	1.02	11.15	0.67
Truck Travel on Unpaved Surfaces		0.2	6.4					
		Factor	23			147.20		
		Area (Acres)	Emission Factor					
Storage Piles (Acres):		0.5	85.6 per acre			42.80		
Fugitive dust								
Acres Actively Disturbed/Day:		2	60.7 per acre			121.40		
Demolition								
Cubic Ft of Buildings Demolished/Day:		2000				0.84		
TOTAL ESTIMATED EMISSIONS								
subtotal lbs/day				10.69	120.61	316.31	60.73	2.25

Assumes 3 pieces of heavy-duty diesel-powered equipment operating an average of 8 hours/day; based on year 2004 emission factors obtained from the SMAQMD Roadway Construction Model (2004); 20 employee trips and 32 haul truck trips/day; emission factors derived from Emfac2002 for year 2004; Fugitive dust, demolition, and storage pile emission factors derived from SMAQMD Air Quality Thresholds of Significance (1994). Truck travel on unpaved surfaces derived from EDCAPCD CEQA Guide (2001). Estimated emissions are uncontrolled.

SHORT-TERM CONSTRUCTION EMISSIONS-OFFSITE ACTIVITIES

Diesel Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
scraper/earthmover	2	8	16	3.59	25.58	1.3	19.64	0.95
wheeled dozer	2	8	16	3.58	29.87	1.49	18.42	0.305
wheeled loader	2	8	16	1.35	8.04	0.26	11.52	0.33
			Subtotal lbs/day	8.52	63.49	3.05	49.58	1.59

Offsite Mobile Source Emissions

	Trips	Trip length	Miles/day	Emission Factor (g/mile)				
Employee	20	20	400	0.069	0.594	0.017	3.34	0.003
Truck	20	50	1000	0.597	16.046	0.284	2.326	0.188
Employee trips				0.06	0.52	0.01	2.95	0.00
Truck trips				1.32	35.37	0.63	5.13	0.41
			Subtotal lbs/day	1.38	35.90	0.64	8.07	0.42

			PM10
Truck Travel on Unpaved Surfaces (miles):	0.5	10	
Emission Factor:		23	230.00
	(Acres)	Emission Factor	
Storage Piles (Acres):	0.5	85.6 per acre	42.80
Fugitive dust			
Actively Disturbed/Day (Acres):	1	60.7 per acre	60.70
Paving			
Total Area Paved (Acres):	1.5		
Days Paving:	10		
Avg. Paved/Day (Acres)	0.15	2.62 per acre	0.39

TOTAL ESTIMATED EMISSIONS	ROG	NOx	PM10	CO	SOx
subtotal lbs/day	9.90	99.39	337.58	57.65	2.00

Assumes 3 pieces of heavy-duty diesel-powered equipment operating an average of 8 hours/day; based on year 2004 emission factors obtained from the SMAQMD Roadway Construction Model (2004); 20 employee trips and 20 haul truck trips/day; emission factors derived from Emfac2002 for year 2004; Fugitive dust, paving, and storage pile emission factors derived from SMAQMD Air Quality Thresholds of Significance (1994). Truck travel on unpaved surfaces derived from EDCAPCD CEQA Guide (2001). Estimated emissions are uncontrolled.

PATTERSON SAND AND GRAVEL - DAILY EMISSIONS SUMMARY

TOTAL ESTIMATED FACILITY EMISSIONS: ROG

	Emission (lbs/day)						
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Processing Plant	5.33	5.33	5.33	5.33	5.33	5.33	5.33
Batch Plant	n/a	428.40	428.40	428.40	428.40	428.40	428.40
Offsite On-Highway Mobile	109.00	89.17	79.39	36.88	23.25	20.84	20.84
Onsite Off-Highway Mobile	62.34	62.34	62.68	62.89	62.89	62.89	62.89
Onsite On-Highway Mobile	1.27	1.04	0.93	0.43	0.30	0.24	0.24
Total:	177.94	586.28	576.72	533.92	520.16	517.69	517.69
Net Difference:		408.35					

TOTAL ESTIMATED FACILITY EMISSIONS: NOx

	Emission (lbs/day)						
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Processing Plant	25.05	25.05	25.05	25.05	25.05	25.05	25.05
Batch Plant	n/a	199.50	199.50	199.50	199.50	199.50	199.50
Offsite On-Highway Mobile	2921.24	2387.80	2096.45	718.35	239.76	159.60	159.60
Onsite Off-Highway Mobile	425.38	425.38	348.98	213.99	213.99	213.99	213.99
Onsite On-Highway Mobile	15.22	12.48	10.96	3.77	2.72	0.84	0.84
Total:	3386.89	3050.21	2680.93	1160.66	681.02	598.98	598.98
Net Difference:		-336.68					

TOTAL ESTIMATED FACILITY EMISSIONS: PM-10

	Emission (lbs/day)						
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Processing Plant	55.83	55.83	55.83	55.83	55.83	55.83	55.83
Batch Plant	n/a	153.62	153.62	153.62	153.62	153.62	153.62
Offsite On-Highway Mobile	51.75	42.31	35.48	15.87	8.39	7.20	7.20
Onsite Off-Highway Mobile	21.88	21.88	17.85	11.48	11.48	11.48	11.48
Onsite On-Highway Mobile	0.58	0.47	0.40	0.17	0.10	0.09	0.09
Fugitive PM-10 (Controlled)	74.60	141.17	157.58	164.61	223.21	188.05	47.62
Total:	204.64	415.28	420.75	401.57	452.61	416.25	275.83
Net Difference [Fugitive PM]:		210.64	[82.98]	[90.01]	[148.61]	[113.45]	[-26.98]

TOTAL ESTIMATED FACILITY EMISSIONS: SOx

	Emission (lbs/day)						
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Processing Plant	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Batch Plant	n/a	21.95	21.95	21.95	21.95	21.95	21.95
Offsite On-Highway Mobile	34.20	27.95	27.95	3.14	3.14	3.14	3.14
Onsite OffHighway Mobile	11.82	11.82	11.82	11.82	11.82	11.82	11.82
Onsite OnHighway Mobile	0.12	0.10	0.10	0.01	0.01	0.01	0.01
Total:	49.72	65.39	65.39	40.50	40.50	40.50	40.50
Net Difference:		15.67					

TOTAL ESTIMATED FACILITY EMISSIONS: CO

	Emission (lbs/day)						
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Processing Plant	11.42	11.42	11.42	11.42	11.42	11.42	11.42
Batch Plant	0.00	372.40	372.40	372.40	372.40	372.40	372.40
Offsite On-Highway Mobile	445.03	369.25	324.48	162.71	120.64	111.58	111.58
Onsite OffHighway Mobile	352.01	352.01	312.84	201.88	201.88	201.88	201.88
Onsite OnHighway Mobile	17.97	14.82	5.13	2.59	1.93	1.79	1.79
Total:	826.44	1119.89	1026.26	751.00	708.27	699.07	699.07
Net Difference:		293.46					

SUMMARY OF TOTAL PROJECT EMISSIONS

		Proposed Expansion Emission Totals (lbs/day)					
	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
ROG	177.94	586.28	576.72	533.92	520.16	517.69	517.69
NOx	*3386.89*	*3050.21*	*2680.93*	*1160.66*	*681.02*	*598.98*	*598.98*
PM-10	204.64	415.28	420.75	401.57	452.61	416.25	275.83
SOx	49.72	65.39	65.39	40.50	40.50	40.50	40.50
CO	826.44	1119.89	1026.26	751.00	708.27	699.07	699.07

FUGITIVE PM-10 EMISSIONS (CONTROLLED)

Unpaved Haul Roads

	Existing Permit[1]	Proposed Expansion Emission Totals (lbs/day) Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Maximum Haul Distance (feet):	660.00	3,500.00	4,200.00	4,500.00	7,000.00	5,500.00	1,800.00
Distance to Plant (miles):	0.13	0.66	0.80	0.85	1.33	1.04	0.34
PM-10 Haul Road Emissions (lbs/day) Controlled [1]:	15.47	82.04	98.45	105.48	164.08	128.92	42.19

[1] Based on Unpaved Haul Road calculations obtained from the existing ATC permit issued by the Placer County APCD (12/30/98); assumes average haul trip distance of 1/8 mile. Controlled emissions assumes continued watering of unpaved surfaces in accordance with existing permit requirements. Predicted emissions for each of the proposed expansion phases assume no change in processing rates, in comparison to existing permit conditions, and are based on the maximum estimated distance between the expansion area and processing plant.

Truck Loading

	Existing Permit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
PM-10 Emissions (lbs/day) Controlled [1]:	1.68	1.68	1.68	1.68	1.68	1.68	1.68

[2] Based on truck loading calculations obtained from the existing ATC permit issued by the Placer County APCD (12/30/98). Controlled emissions assumes continued watering in accordance with existing permit requirements. Predicted emissions for each of the proposed expansion phases assume no change in processing rates, in comparison to existing permit conditions.

Wind Erosion of Continuously Active Storage Piles

	Existing Permit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
PM-10 Emissions (lbs/day) Controlled [1]:	0.26	0.26	0.26	0.26	0.26	0.26	0.26

	Existing Permit	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Total Emissions (Controlled) From Above Sources:	17.41	83.98	100.39	107.42	166.02	130.86	44.13
Emissions from Stationary Sources:	53.70	53.70	53.70	53.70	53.70	53.70	53.70
Total Emissions (Controlled) Remaining Sources (e.g.,material extraction, etc.) [1]:	3.49	3.49	3.49	3.49	3.49	3.49	3.49
Total Fugitive Emissions:	74.60	141.17	157.58	164.61	223.21	188.05	101.32
Net Increase in Fugitive PM-10 (Worst-Case):		66.57	82.98	90.01	148.61	113.45	26.72

[3] Based on controlled emissions calculations obtained from the existing Placer County APCD ATC 97-47. Predicted emissions for each of the proposed expansion phases are based on the maximum estimated haul distances from the plant to the proposed expansion area; assumes no change in processing rates or control efficiencies, in comparison to existing permit conditions.

STATIONARY SOURCE PM-10 EMISSIONS (CONTROLLED)

	Estimated Emissions (lbs/day) Controlled	
	Existing Permit[1]	All Phases[2]
Portable Rock Crushing Plant	30.1	30.1
Stationary Wash Plant	20.1	20.1
Chieftan Powerscreen	3.5	3.5
TOTAL:	53.7	53.7
		0

[1] Based on existing permit limitations.

[2] Does not include the proposed batch plant. PM-10 emissions for the proposed asphalt batch plant are calculated separately. Refer to worksheet entitled "Batch Plant Emissions."

DIESEL WATER PUMP EMISSIONS (CONTROLLED)

Engine Manufacturer	Caterpillar
Engine Model	3116
Power Rating	142 hp (Mfgr. spec. sheet)
Daily Hours of Operation	15 hr/day
Annual Hours of Operation	3850 hr/yr

	PM10	NOx	ROG	SOx	CO
Emission Factors (lb/bhp-hr)	0.0010	0.0147	0.0025	0.0021	0.0067
Max. Hourly Emissions (lb/hr)	0.142	2.0874	0.355	0.2982	0.9514
Max. Daily Emissions (lb/day)	2.13	31.311	5.33	4.473	14.27
Max. Annual Emissions (lb/yr)	546.7	8036.5	1366.75	1148.1	3662.89

Estimated Batch Plant Emissions

Plant Type	Drum
Dryer	Dryer
Burner Fuel	Natural Gas
Control	Fabric Filter
Avg. Processing Rate	250 tph
Typ. Day Max Process Rate	300 tph
Max. Day Capacity Rate:	350 tph

	Emission Factors (lbs/ton)	Processing Rate (tons/hour)	Hours/Day	Average Daily Usage Rate (Percent)	Emissions (lbs/hour)[2]	Emissions (lbs/day)[3]
Controlled Particulate (TSP):	0.018	350	19	100	6.3	119.70
Controlled Particulate (PM-10):	2.2	350	19	100	8.085	153.62
Sulphur Dioxide:	0.0033	350	19	100	1.155	21.95
Nitrogen Oxide:	0.03	350	19	100	10.5	199.50
Carbon Monoxide:	0.056	350	19	100	19.6	372.40
Hydrocarbons (TOCs):	0.051	350	19	100	17.85	339.15

Emissions are based on manufacturer's operational data/emission rates and AP-42 emission ractors for a drum mix hot mix asphalt plant. Controlled PM-10 emissions assume implementation of BACT would be required in accordance with existing district permitting requirements. For purposes of this analysis, BACT assumes a controlled emission rate of 98.95% per manufacturer's data.
Source: Balzer Pacific Equipment, 1997

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - BASELINE (EXISTING YR 2004)

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	1126	140.75	0.69	8.21	0.06	10.26	0.32
Employee/Other Vehicles	67	8.38	0.01	0.02	0.00	0.25	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.06	0.00	0.09	0.00
			0.71	8.29	0.06	10.60	0.32

Number of vehicle trips is based on the estimated average daily haul truck trips obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip *distance of approximately 0.125 miles.* Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
MINING AREA MOBILE SOURCE EMISSIONS			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.03	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.06	0.00
			0.00	0.05	0.00	0.09	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
PLANT ENTRANCE ROADWAY (ONSITE)			ROG	NOx	SOx	CO	PM10
Haul Trucks	1126	140.75	0.54	6.81	0.06	7.07	0.25
Employee Vehicles	67	8.38	0.01	0.02	0.00	0.14	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.06	0.00
			0.56	6.88	0.06	7.28	0.25

Number of vehicle trips is based on the estimated highest day haul truck trips obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	1.27	15.22	0.12	17.97	0.58

Emfac2002 Emission Factors: Year 2004
1965-2004 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.70	1.06	0.01	13.65	0.05	0.01	0.01
HHDT	2.24	26.46	0.19	33.05	1.03	0.04	0.01
MHDT	0.93	18.54	0.13	28.20	0.92	0.01	0.01

Emfac2002 Emission Factors: Year 2004
1965-2004 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.45	0.91	0.01	7.72	0.03	0.01	0.01
HHDT	1.76	21.95	0.19	22.79	0.81	0.04	0.01
MHDT	0.73	15.38	0.13	19.44	0.73	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002/Urbemis2002).

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - PHASE I

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.57	6.71	0.05	8.38	0.26
Employee Vehicles	69	8.63	0.01	0.02	0.00	0.26	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.06	0.00	0.09	0.00
			0.58	6.79	0.05	8.74	0.26

Number of vehicle trips is based on the estimated *maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on* an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
MINING AREA MOBILE SOURCE EMISSIONS			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.03	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.06	0.00
			0.00	0.05	0.00	0.09	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance. Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
PLANT ENTRANCE ROADWAY (ONSITE)			ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.44	5.56	0.05	5.78	0.20
Employee Vehicles	69	8.63	0.01	0.02	0.00	0.15	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.06	0.00
			0.46	5.63	0.05	5.99	0.21

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2004; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	1.04	12.48	0.10	14.82	0.47

Emfac2002 Emission Factors: Year 2004
1965-2004 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.70	1.06	0.01	13.65	0.05	0.01	0.01
HHDT	2.24	26.46	0.19	33.05	1.03	0.04	0.01
MHDT	0.93	18.54	0.13	28.20	0.92	0.01	0.01

Emfac2002 Emission Factors: Year 2004
1965-2004 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.45	0.91	0.01	7.72	0.03	0.01	0.01
HHDT	1.76	21.95	0.19	22.79	0.81	0.04	0.01
MHDT	0.73	15.38	0.13	19.44	0.73	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002/Urbemis2002).

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - PHASE 2

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.50	5.89	0.05	2.84	0.22
Employee Vehicles	69	8.63	0.01	0.02	0.00	0.13	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.06	0.00	0.03	0.00
			0.52	5.96	0.05	3.00	0.22

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2006; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
MINING AREA MOBILE SOURCE EMISSIONS			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.02	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.02	0.00
			0.00	0.05	0.00	0.04	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Based on Emfac2002 composite emission factors for year 2006; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
PLANT ENTRANCE ROADWAY (ONSITE)			ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.40	4.89	0.05	1.96	0.17
Employee Vehicles	69	8.63	0.01	0.01	0.00	0.11	0.00
Water Truck	1	1.50	0.00	0.05	0.00	0.02	0.00
			0.40	4.95	0.05	2.09	0.17

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2006; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	0.93	10.96	0.10	5.13	0.40

Emfac2002 Emission Factors: Year 2006
1965-2006 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.55	0.86	0.01	6.63	0.10	0.01	0.01
HHDT	1.99	23.23	0.19	11.22	0.85	0.04	0.01
MHDT	0.90	16.79	0.13	7.82	0.85	0.01	0.01

Emfac2002 Emission Factors: Year 2006
1965-2006 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.35	0.74	0.01	5.79	0.04	0.01	0.01
HHDT	1.56	19.27	0.19	7.74	0.67	0.04	0.01
MHDT	0.71	13.93	0.13	5.39	0.67	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002/Urbemis2002).

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - PHASE 3

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.23	2.02	0.01	1.44	0.09
Employee Vehicles	69	8.63	0.00	0.01	0.00	0.06	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.02	0.00	0.02	0.00
			0.24	2.05	0.01	1.51	0.09

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. One lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Based on Emfac2002 composite emission factors for year 2015; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
MINING AREA MOBILE SOURCE EMISSIONS			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.01	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.02	0.00	0.01	0.00
			0.00	0.02	0.00	0.02	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle, 12 hrs/day. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2015; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
PLANT ENTRANCE ROADWAY (ONSITE)			ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.18	1.67	0.01	0.99	0.07
Employee Vehicles	69	8.63	0.00	0.01	0.00	0.05	0.00
Water Truck	1	1.50	0.00	0.02	0.00	0.01	0.00
			0.19	1.70	0.01	1.05	0.07

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2015; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	0.43	3.77	0.01	2.59	0.17

Emfac2002 Emission Factors: Year 2015
1970-2015 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.20	0.33	0.01	2.90	0.06	0.01	0.01
HHDT	0.92	7.96	0.02	5.67	0.36	0.04	0.01
MHDT	0.62	7.50	0.01	6.06	0.52	0.01	0.01

Emfac2002 Emission Factors: Year 2015
1970-2015 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.13	0.29	0.01	2.56	0.04	0.01	0.01
HHDT	0.73	6.60	0.02	3.91	0.28	0.04	0.01
MHDT	0.48	6.22	0.01	4.18	0.41	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002/Urbemis2002).

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - PHASE 4

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.16	1.32	0.01	1.09	0.05
Employee Vehicles	69	8.63	0.00	0.00	0.00	0.03	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.02	0.00
			0.17	1.32	0.01	1.13	0.06

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2025; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
MINING AREA MOBILE SOURCE EMISSIONS			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.00	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.01	0.00
			0.00	0.00	0.00	0.02	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2025; includes exhaust and evaporative emissions, brake wear, and tire wear.

			Emissions (lbs/day)				
PLANT ENTRANCE ROADWAY (ONSITE)			ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.13	1.39	0.01	0.75	0.04
Employee Vehicles	69	8.63	0.00	0.00	0.00	0.02	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.01	0.00
			0.13	1.39	0.01	0.78	0.04

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2025; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	0.30	2.72	0.01	1.93	0.10

Emfac2002 Emission Factors: Year 2025
1980-2025 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.09	0.15	0.01	1.34	0.06	0.01	0.01
HHDT	0.65	5.20	0.02	4.29	0.21	0.04	0.01
MHDT	0.41	0.37	0.01	4.93	0.35	0.01	0.01

Emfac2002 Emission Factors: Year 2025
1980-2025 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.06	0.13	0.01	1.21	0.04	0.01	0.01
HHDT	0.50	5.47	0.02	2.96	0.16	0.04	0.01
MHDT	0.31	0.38	0.01	3.40	0.23	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002).

ESTIMATED DAILY EMISSIONS-ONSITE MOBILE SOURCE (ON HIGHWAY) EMISSIONS - PHASES 5 & 6

PROCESSING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
Source	Number of Vehicles	Miles/Day	ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.13	0.45	0.01	1.02	0.05
Employee Vehicles	69	8.63	0.00	0.00	0.00	0.02	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.02	0.00
			0.13	0.45	0.01	1.05	0.05

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. One lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Based on Emfac2002 composite emission factors for year 2040; includes exhaust and evaporative emissions, brake wear, and tire wear.

MINING AREA MOBILE SOURCE EMISSIONS			Emissions (lbs/day)				
			ROG	NOx	SOx	CO	PM10
Employee Vehicles	12	1.50	0.00	0.00	0.00	0.00	0.00
Lube Truck	1	0.13	0.00	0.00	0.00	0.00	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.01	0.00
			0.00	0.00	0.00	0.01	0.00

Assumes 12 daily vehicle trips for transportation of employees and equipment to and from the mining area, 0.125 mile travel distance/vehicle; one lube truck trip/day, 0.125 mile travel distance; 1 water truck/hour, 0.125 mile travel distance/vehicle. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2040; includes exhaust and evaporative emissions, brake wear, and tire wear.

PLANT ENTRANCE ROADWAY (ONSITE)			Emissions (lbs/day)				
			ROG	NOx	SOx	CO	PM10
Haul Trucks	920	115.00	0.10	0.37	0.01	0.70	0.04
Employee Vehicles	69	8.63	0.00	0.00	0.00	0.01	0.00
Water Truck	1	1.50	0.00	0.00	0.00	0.01	0.00
			0.11	0.38	0.01	0.73	0.04

Number of vehicle trips is based on the estimated maximum daily haul truck trips, under average annual production rates, obtained from the traffic analysis prepared for this project. Total miles/day is based on an average vehicle trip distance of approximately 0.125 miles. Based on Emfac2002 composite emission factors for year 2040; includes exhaust and evaporative emissions, brake wear, and tire wear.

	ROG	NOx	SOx	CO	PM10
TOTAL ONSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS	0.24	0.84	0.01	1.79	0.09

Emfac2002 Emission Factors: Year 2040
1995-2040 Inclusive; Speed: 5 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.05	0.09	0.01	0.85	0.06	0.01	0.01
HHDT	0.52	1.77	0.02	4.01	0.18	0.04	0.01
MHDT	0.37	1.51	0.01	4.60	0.30	0.01	0.01

Emfac2002 Emission Factors: Year 2040
1995-2040 Inclusive; Speed: 10 mph

	ROG	NOx	SOx	CO	PM10	Tire Wear PM10	Brake Wear PM10
LDA	0.03	0.08	0.01	0.77	0.04	0.01	0.01
HHDT	0.41	1.47	0.02	2.77	0.14	0.04	0.01
MHDT	0.29	1.25	0.01	3.17	0.24	0.01	0.01

Emission factors were obtained from the Emfac2002 computer program, based on the highest emission factor for either summer (60F) or winter (40F) conditions (Emfac2002).

Baseline & Phase 1 (Year 2004)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	15	30	6.90	41.70	2.25	47.03	2.37
off-highway truck	5	15	75	33.56	206.81	10.69	191.91	5.93
scraper/earthmover	1	15	15	6.73	47.96	2.44	36.83	1.77
wheeled dozer	2	15	30	13.43	112.01	5.59	69.08	1.14
wheeled loader	1	15	15	1.73	16.89	0.92	7.18	0.62
Pounds/Day				62.34	425.38	21.88	352.01	11.82

*Based on typically daily hours of operation. Assumes 11 hrs/day.

Phases 2 (Year 2006)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	15	30	6.90	33.90	1.76	35.40	2.37
off-highway truck	5	15	75	33.75	164.16	8.44	167.53	5.93
scraper/earthmover	1	15	15	6.81	38.14	1.97	35.31	1.77
wheeled dozer	2	15	30	13.50	97.16	4.88	66.79	1.14
wheeled loader	1	15	15	1.73	15.62	0.81	7.82	0.62
Pounds/Day				62.68	348.98	17.85	312.84	11.82

*Based on typically daily hours of operation. Assumes 11 hrs/day.

Phases 3-6 (Post-2010)

DAILY EMISSIONS*

Mining/Reclamation Equipment	Number	Hours/Day	Total Hours	ROG	NOx	PM10	CO	SOx
excavator	2	15	30	6.90	17.55	1.05	17.96	2.37
off-highway truck	5	15	75	33.75	97.97	5.06	87.84	5.93
scraper/earthmover	1	15	15	6.83	24.36	1.31	24.47	1.77
dozer	2	15	30	13.69	64.43	3.49	62.21	1.14
wheeled loader	1	15	15	1.73	9.69	0.56	9.39	0.62
Pounds/Day				62.89	213.99	11.48	201.88	11.82

*Based on typically daily hours of operation. Assumes 11 hrs/day.

Emission Factors

Mining/Reclamation Equipment - 2004	ROG	NOx	PM10	CO	SOx
excavator	0.23	1.39	0.075	1.5675	0.079 lbs/hr
off-highway truck	0.4475	2.7575	0.1425	2.55875	0.079 lbs/hr
scraper/earthmover	0.44875	3.1975	0.1625	2.455	0.118 lbs/hr
dozer	0.4475	3.73375	0.18625	2.3025	0.038 lbs/hr
wheeled loader	0.115	1.12625	0.06125	0.47875	0.041 lbs/hr
Mining/Reclamation Equipment - 2006					
excavator	0.23	1.13	0.05875	1.18	0.079 lbs/hr
off-highway truck	0.45	2.18875	0.1125	2.23375	0.079 lbs/hr
scraper/earthmover	0.45375	2.5425	0.13125	2.35375	0.118 lbs/hr
dozer	0.45	3.23875	0.1625	2.22625	0.038 lbs/hr
wheeled loader	0.115	1.04125	0.05375	0.52125	0.041 lbs/hr
Mining/Reclamation Equipment - 2010					
excavator	0.23	0.585	0.035	0.59875	0.079 lbs/hr
off-highway truck	0.45	1.30625	0.0675	1.17125	0.079 lbs/hr
scraper/earthmover	0.455	1.62375	0.0875	1.63125	0.118 lbs/hr
dozer	0.45625	2.1475	0.11625	2.07375	0.038 lbs/hr
wheeled loader	0.115	0.64625	0.0375	0.62625	0.041 lbs/hr

Off-Highway equipment emissions of ROG, NOx, PM-10, and CO are based on equipment emission factors derived from the Roadway Construction Equipment Model, v5.1, SMAQMD, 2004.

Emissions of SOx were calculated using U.S. AP-42 emission factors (1985) and assumes no change in emission rates for all years analyzed.

OFFSITE ON-HIGHWAY MOBILE SOURCE EMISSIONS

Scenario	# Trips	Miles/Trip	Total Miles	Emissions				
				ROG	NOx	PM-10	SOx	CO
Baseline		Emission Factors-HHDD(g/m):		0.597	16.046	0.284	0.188	2.326
		Emission Factors-LDA(g/m):		0.069	0.594	0.017	0.003	3.34
Haul Trucks	1126	75	84450	108.54	2,917.30	51.63	34.18	422.89
Employee & Delivery	154	20	3080	0.46	3.94	0.11	0.02	22.15
				109.00	2,921.24	51.75	34.20	445.03
Phase 1		Emission Factors (HHDD):		0.597	16.046	0.284	0.188	2.326
		Emission Factors (LDA):		0.069	0.594	0.017	0.003	3.34
Haul Trucks	920	75	69000	88.68	2,383.58	42.19	27.93	345.52
Employee & Delivery	165	20	3300	0.49	4.22	0.12	0.02	23.73
				89.17	2,387.80	42.31	27.95	369.25
Phase 2		Emission Factors (HHDD):		0.53	14.09	0.24	0.188	2.05
		Emission Factors (LDA):		0.07	0.48	0.02	0.003	2.83
Haul Trucks	920	75	69000	78.88	2,093.02	35.35	27.93	304.37
Employee & Delivery	165	20	3300	0.51	3.42	0.13	0.02	20.11
				79.39	2,096.45	35.48	27.95	324.48
Phase 3		Emission Factors (HHDD):		0.25	4.83	0.11	0.02	1.04
		Emission Factors (LDA):		0.03	0.19	0.02	0.00	1.26
Haul Trucks	920	75	69000	36.69	717.04	15.75	3.12	153.75
Employee & Delivery	165	20	3300	0.18	1.31	0.13	0.02	8.97
				36.88	718.35	15.87	3.14	162.71
Phase 4		Emission Factors (HHDD):		0.16	1.61	0.06	0.02	0.78
		Emission Factors (LDA):		0.01	0.08	0.01	0.00	0.59
Haul Trucks	920	75	69000	23.17	239.16	8.32	3.12	116.46
Employee & Delivery	165	20	3300	0.08	0.60	0.07	0.02	4.18
				23.25	239.76	8.39	3.14	120.64
Phase 5-6		Emission Factors (HHDD):		0.14	1.07	0.05	0.02	0.73
		Emission Factors (LDA):		0.01	0.05	0.01	0.00	0.38
Haul Trucks	920	75	69000	20.80	159.24	7.13	3.12	108.88
Employee & Delivery	165	20	3300	0.04	0.36	0.07	0.02	2.70
				20.84	159.60	7.20	3.14	111.58

Based on Emfac2002 emission factors. Assumes an average speed of 45 mph for haul trucks and 55 mph for employee and delivery vehicles. To be conservative, emission factors are based on the approx. start year of each phase for phases 1 through 4 and year 2040 emission factors for all subsequent phases.